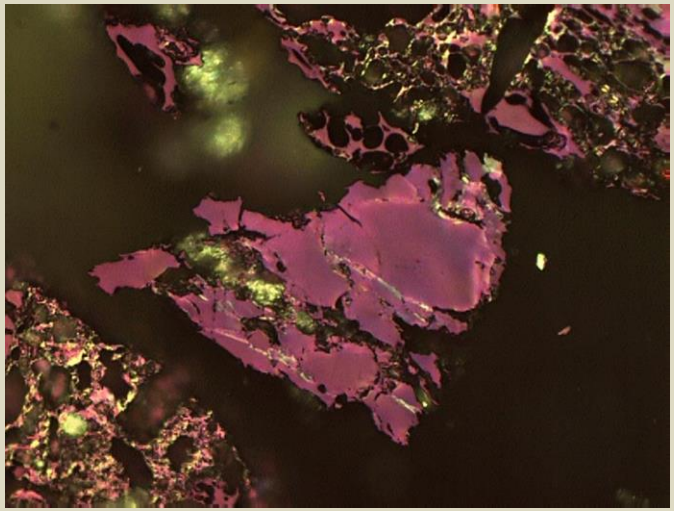
Atlas of Fly Ash Occurrences

Identification and Petrographic Classification of Fly Ash Components
Working Group, Commission III - ICCP

Edited by Isabel Suárez-Ruiz and Bruno Valentim

ISBN: 978-84-608-1416-0



[International Committee for Coal and Organic Petrology - ICCP]

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Isabel Suárez-Ruiz · Bruno Valentim
Editors

Atlas of Fly Ash Occurrences

A tribute to past and future ICCP members

ICCP

International Committee for Coal and Organic Petrology

International Committee for Coal and Organic Petrology- ICCP (www.iccop.org)

Consejo Superior de Investigaciones Científicas (CSIC. Spain). www.csic.es

Porto University – Faculty of Sciences (Portugal). www.up.pt

ISBN: 978-84-608-1416-0

This altas was sponsored by:

Integrated Actions. Spain-Portugal. Reference Project: Ref: PT2009-0122. Ministerio de Ciencia e Innovacion. Spanish Government. Spain.

Programa de Acções Universitárias Integradas Luso-Espanholas 2010/2011: Ref. E-65/10. Conselho de Reitores das Universidades Portuguesas – CRUP. Portugal.

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Petrographic Classification of Fly Ash Components

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Petrographic Classification of Fly Ash Components

Contributors

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Petrographic Classification of Fly Ash Components

Acknowledgments

Programa de Acções Integradas Luso-Espanholas 2010/2011, Conselho de Reitores da Universidade do Porto (CRUP), Acção Integrada Luso-Espanhola E65-10.

Subprograma de Acciones Integradas. Ministério de Ciencia y Innovación, PT2009-0122.

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The conveners of the Fly Ash Working Group also thank the participants who gently participated in the WG Session exercise at the 2011 ICCP Meeting held at Porto (Portugal).

Petrographic Classification of Fly Ash Components

Introduction

The images included in this ATLAS were compiled since 2006 as a result of the work carried out by the Fly Ash Working Group (Commission III) of the International Committee for Coal and Organic Petrology – ICCP on Fly Ash. This working group was convened by Isabel Suárez-Ruiz and Bruno Valentim (www.iccop.org), and aimed at classifying sections of particles (not the all particle).

Fly ash is defined as one of the residues produced during combustion of coal and other feed fuels, and comprises the fine particles that rise with the flue gases.

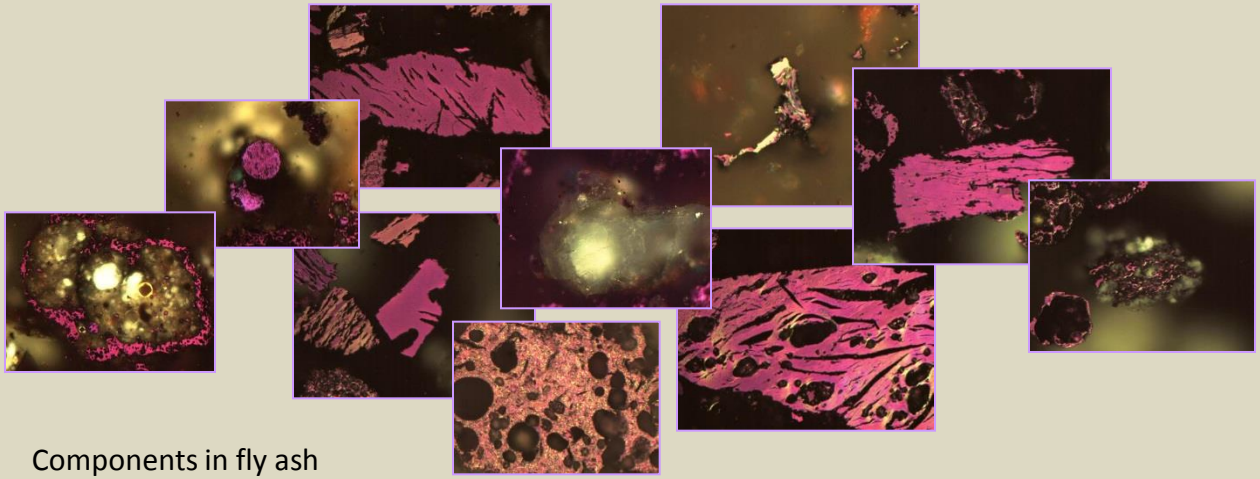
Fly Ash is generally captured by cyclones, electrostatic precipitators or baghouses before the flue gases reach the chimneys of coal- or biomass-fired power plants and other industrial furnaces.

Depending upon the feed fuels being burned and the combustion conditions, the final composition of the fly ash vary considerably. In general, fly ash is mainly made up of a predominant inorganic fraction and a minor organic fraction (unburned carbons- or fly ash carbons).

Petrographic Classification of Fly Ash Components

Aim of the Atlas

Taking into account the varied composition of the Fly Ash, the main purpose of this ATLAS is to help to identify and classify the components that can be found in Fly Ash from coal combustion, co-combustion, and biomass combustion processes, developed in different operating conditions pulverized coal combustion (PCC), fluidized bed combustion (FBC), and others.



Components in fly ash

Petrographic Classification of Fly Ash Components

Provenance of fly ash

The provenance of Fly Ash included here is diverse.
The fly ash derive from coal and coal blends combustion covering all the coal rank scale (low, medium and high rank according to ISO 11760:2005), biomass combustion and co-combustion of coal and biomass, coal and pet coke, among others, in conditions of Pulverized Coal Combustion (PCC), Fluidised Bed Combustion (FBC), both from European Power Plants, specific conditions of stoker boilers and heating boilers.

FBC in ENCE, Navia (Spain) Biomass Power Plant.

Pulverized Coal-fired Power Plant in Velilla (Spain).

Petrographic Classification of Fly Ash Components

Samples, preparation and photomicrographs

Images of Fly Ash Components were taken at the Organic Petrography Laboratory of the INCAR – CSIC in Oviedo (Spain).

For that representative samples of the different Fly Ash were taken and prepared for petrographic analysis following the ISO 7404/2 (2009) Norm.

The petrographic pellets were visually analysed using a Zeiss Axioplan Microscope, and oil immersion (×50 objectives).

The images were taken in two different positions after rotating the microscope stage, with a Leica Camera coupled to the microscope, in incident and polarized light, and with an inserted retarder plate of 1 λ.

Petrographic Classification of Fly Ash Components

Selection of fly ash photomicrographs

The images compiled in this ATLAS are those that were classified by the participants in the "Identification and Petrographic Classification of Components in Fly Ash Working Group".

Three round robins were carried out since 2006 on petrographic classification of more than 600 photomicrographs of different fly ash components.

Those images for which more than 80% of the participants in the WG agreed in their identification and petrographic classification were selected and included in this ATLAS.

Zeiss Axioplan Microscope and digital Leica Camera at the INCAR-CSIC, Spain.

Petrographic classification of Fly Ash (established in 2012)

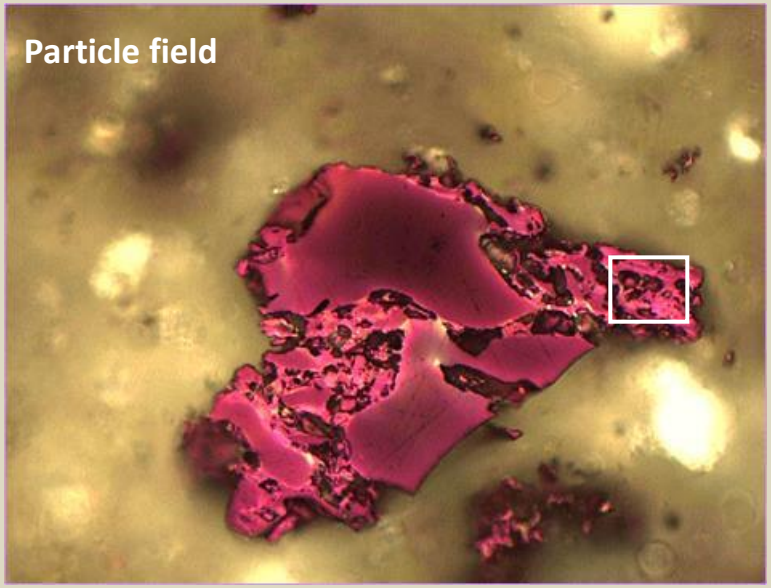
	Level # 1	Level # 2	Level # 3	Level # 4	Level # 5	Level # 6
	Nature	Character	Structure / Morphology	Optical texture	Origin	Type of Particle
FLY ASH COMPONENTS	Organic Fraction Fly Ash Carbons	Fused	Dense / Massive	Isotropic Anisotropic	Coal, Biomass, Pet coke, Other	Apply the ICCP Char Classification
			Porous / Vesiculate	Isotropic Anisotropic		
		Unfused	Dense / Massive	Isotropic Anisotropic		
			Porous / Vesiculate	Isotropic Anisotropic		
	Inorganic Fraction	Composition Metallic / Non-Metallic	Apply the ICCP Char Classification			

Petrographic Classification of Fly Ash Components

Description of the Optical properties of Fly Ash Components, examples

Fly Ash Components are petrographically classified in 6 levels of which:

- 3 levels are addressed to particle field identification; and,
- 3 levels are addressed to the whole particle identification.



Attention: Long side of the pictures: 200 microns

To all levels explanation

Description of the Classification Levels

(note: this is "All levels slide")

Levels of Fly Ash Components classification:

Level # 1 - Nature of Fly Ash Components: Organic, Inorganic

Level # 2 - Optical Character of the Fly Ash Carbons

Level # 3 - Optical Structure / Morphology of the Fly Ash Carbons

Level # 4 - Optical Texture of the Fly Ash Carbons

Level # 5 - Origin / Provenance of the Fly Ash Carbons

Level # 6 - Type of Particle (type of Fly Ash Component): **Apply the ICCP Char Classification**

Inorganic components can be classified according to their nature and composition.

Description of the Classification Levels

Level # 1 - Nature of Fly Ash Components:

i) - Organic Components: Fly Ash Carbons (Unburned Carbons),
ii)- Inorganic Components

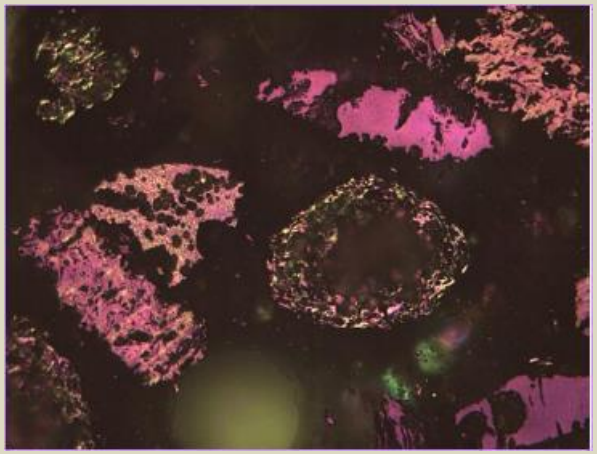
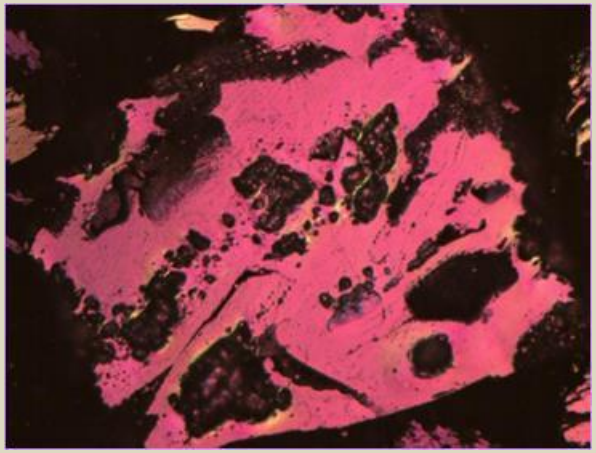
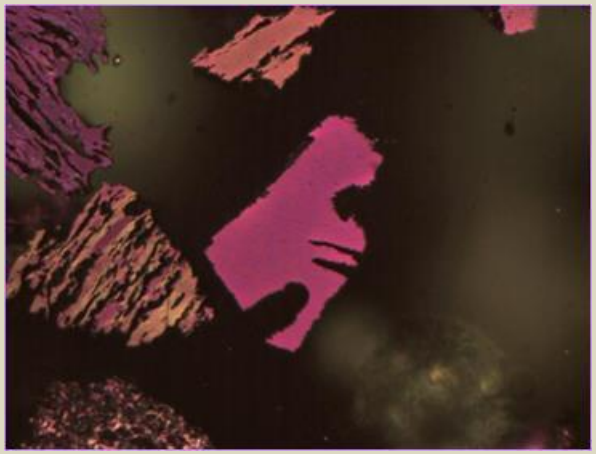
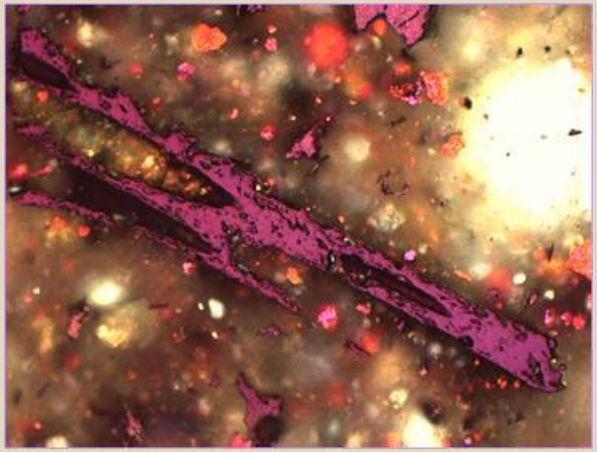
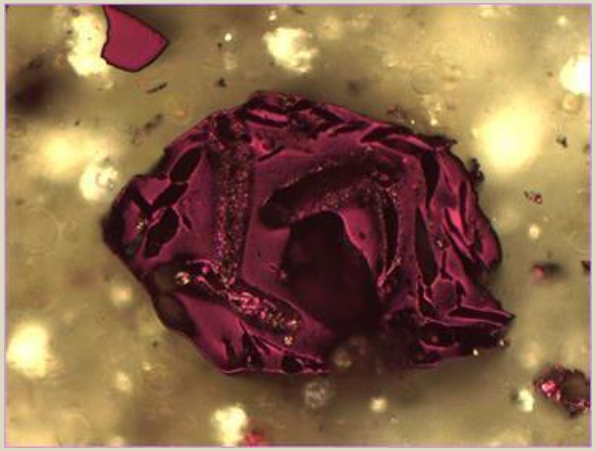
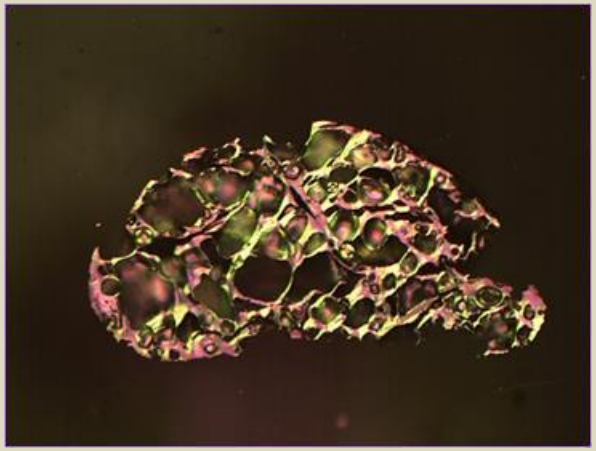
This level of classification of Fly Ash Components is addressed to the whole particle

Examples of Organic Components

Examples of Inorganic Components

Examples of Organic Components

Level # 1: addressed to the whole particle

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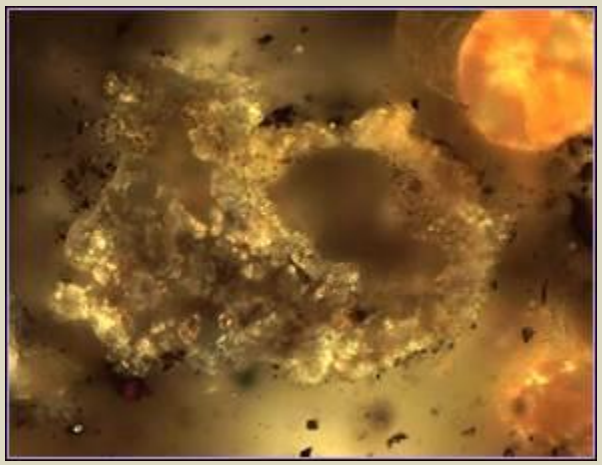
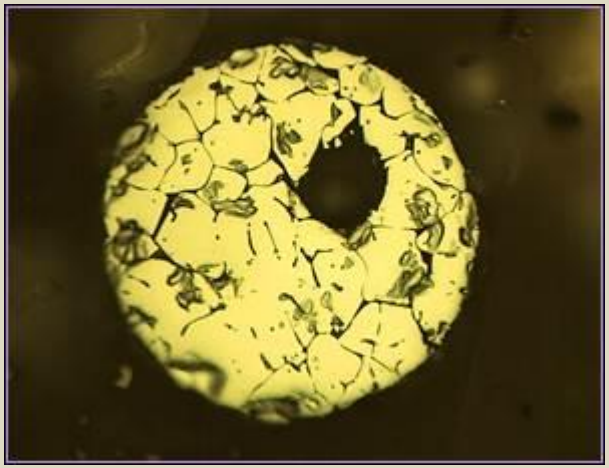
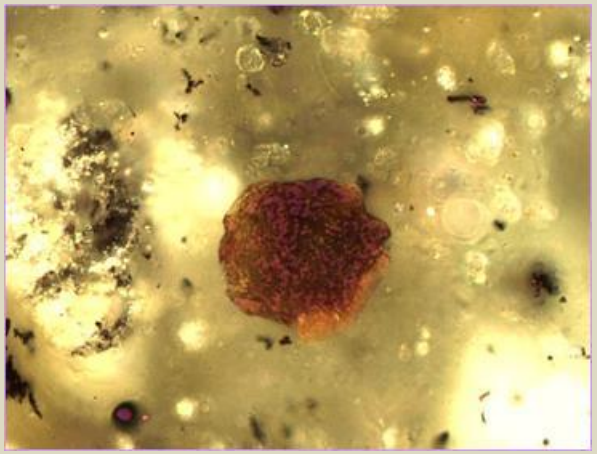
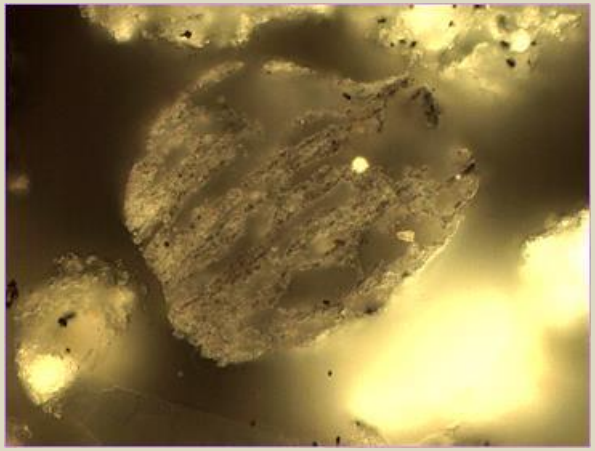
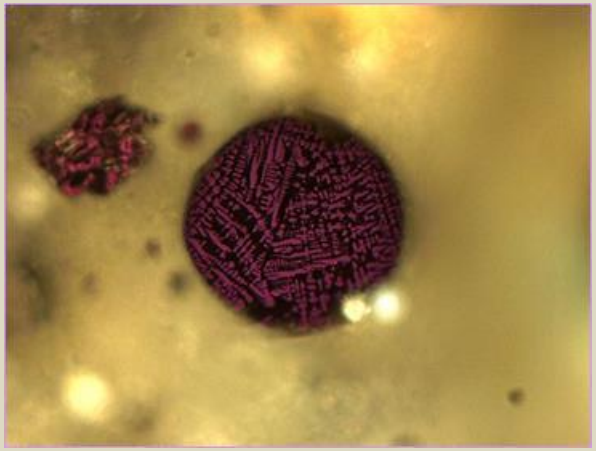
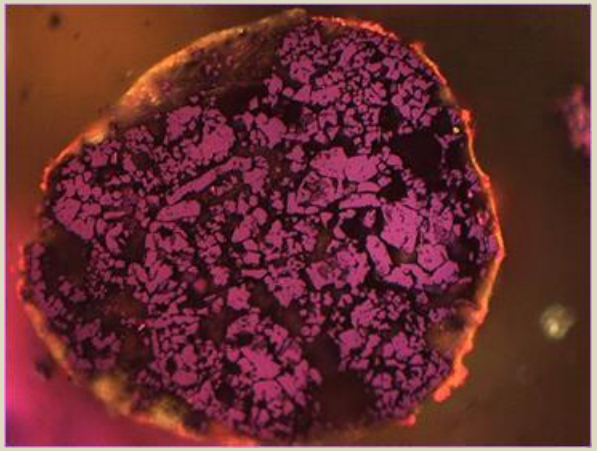
Examples of Inorganic Components

Level # 1: addressed to the whole particle

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To previous slide

To “All levels” slide

Description of the Classification Levels

Level # 2 - Optical Character of the Fly Ash Carbons:

i) – Fused
ii)- Unfused

This level of classification of Fly Ash Components is addressed to the particle field identification.

Definitions:

Fused character: section/field of a particle with rounded or sub-rounded morphology, with evidences of swelling and /or caking, and without sharp edges. The coal petrographers "pyrolytic carbon" also has a fused character since it results from the hydrocarbons decomposition and further condensation at particle edges. Pyrolytic carbon is extremely anisotropic, with curved layers and sweeping anisotropy.

Unfused character: section/field of a particle without any of the described characteristics. Particle section flat, sharp edges, they can show cell structures (original or newly-formed) or structures type "finger gloves".

Examples of Fused and **Unfused character** **(and pyrolytic carbon)**

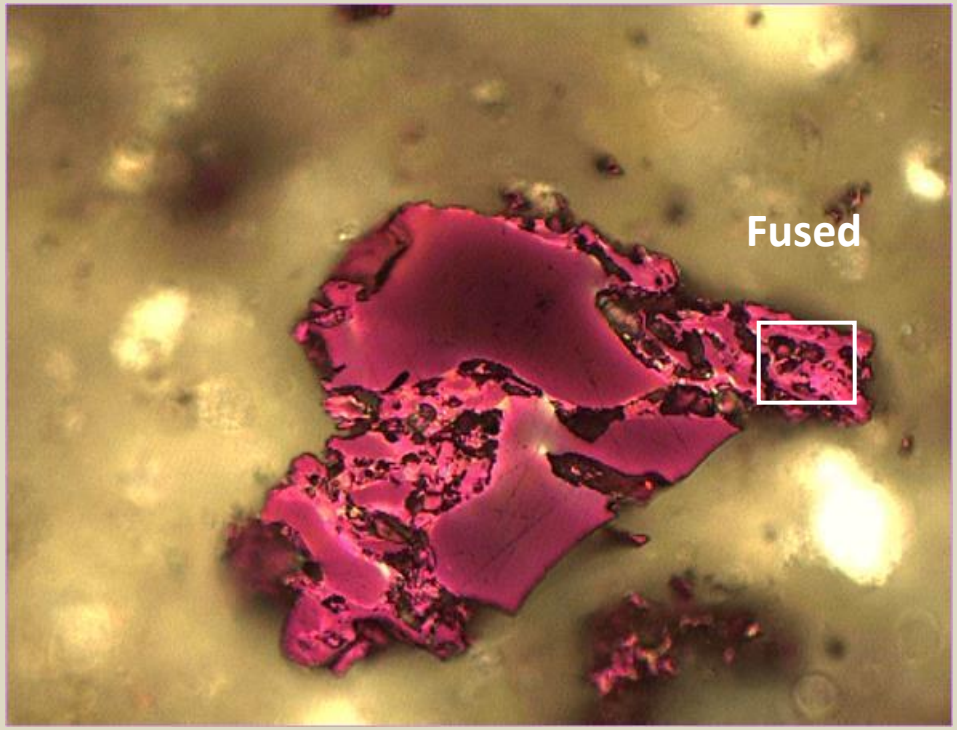
To "All levels" slide

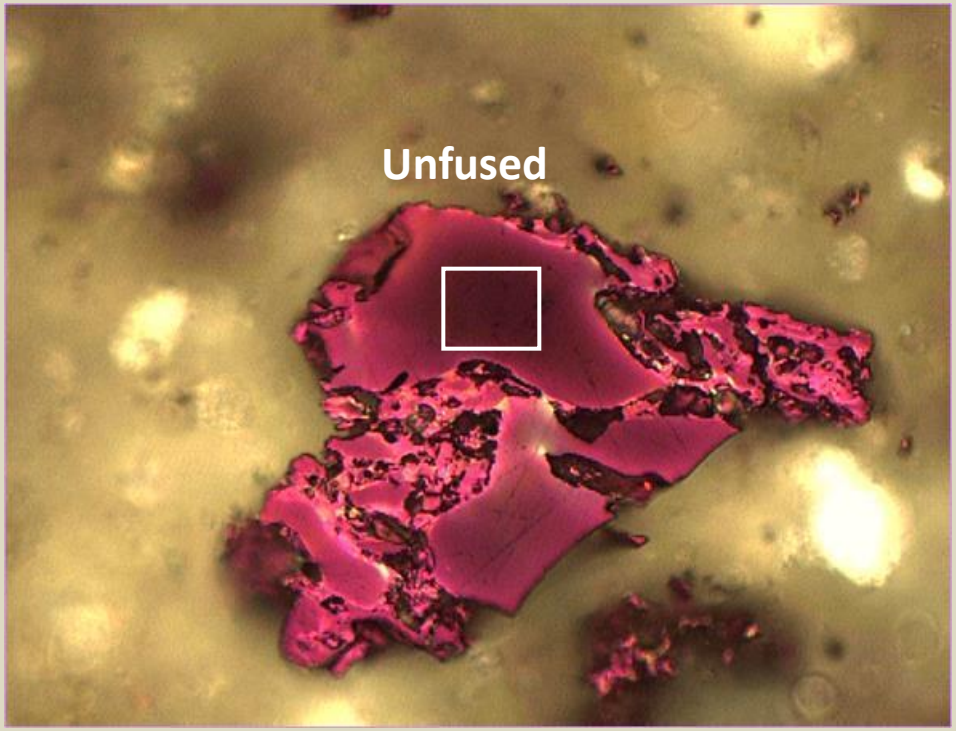
PgUp PgDn

Examples: Optical Character

Particle field identification →

Level # 2: addressed to the particle surface identification





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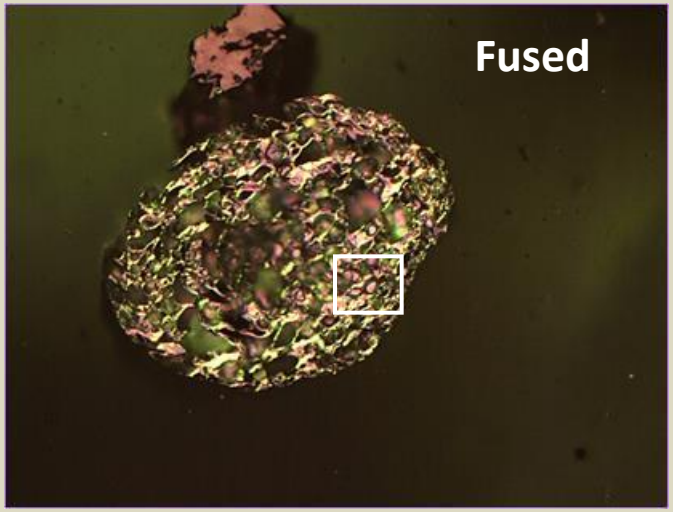
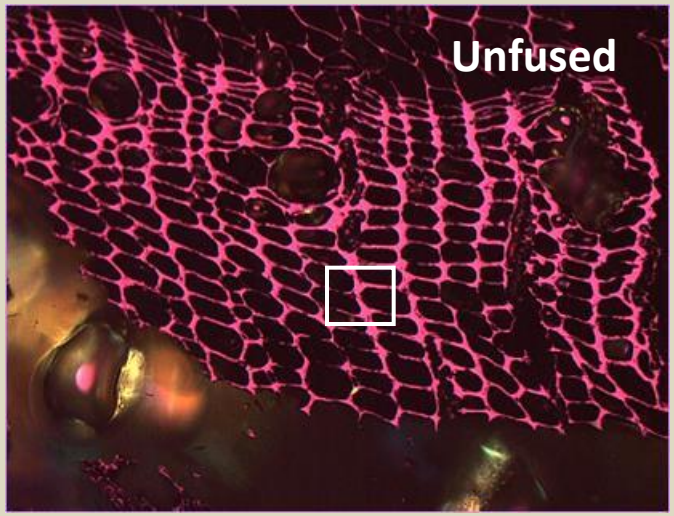
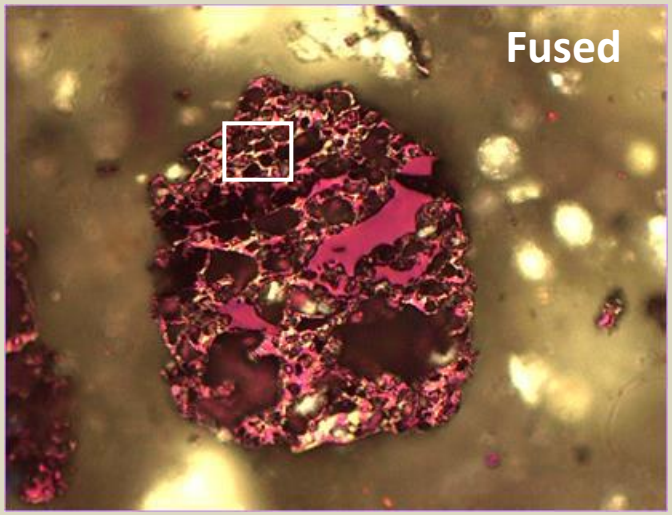
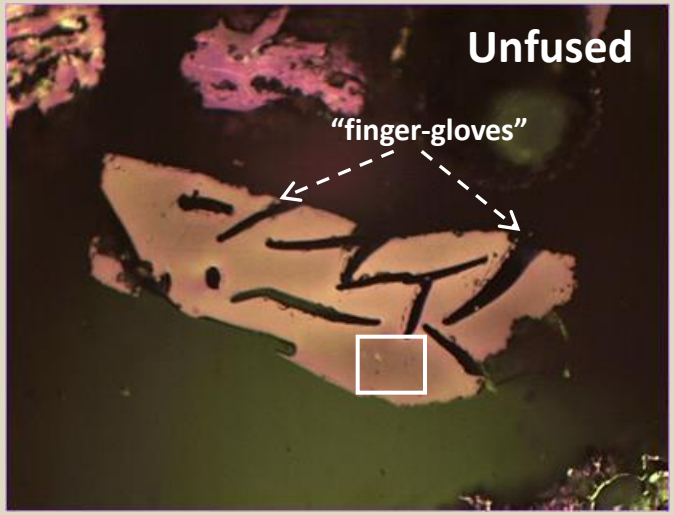
To previous slide

To "All levels" slide









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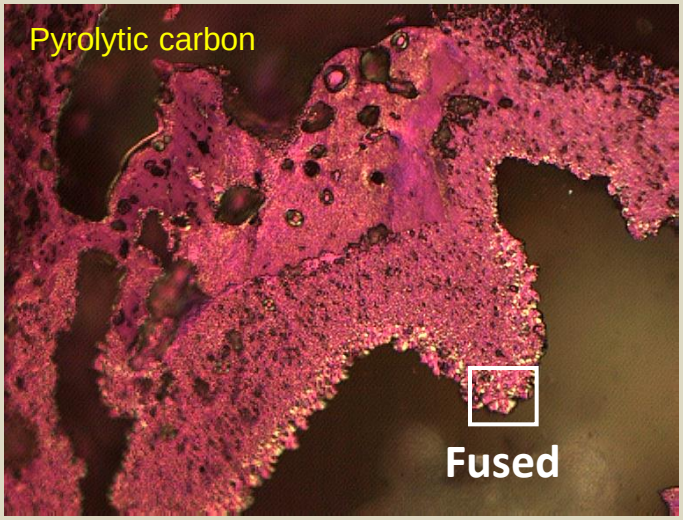
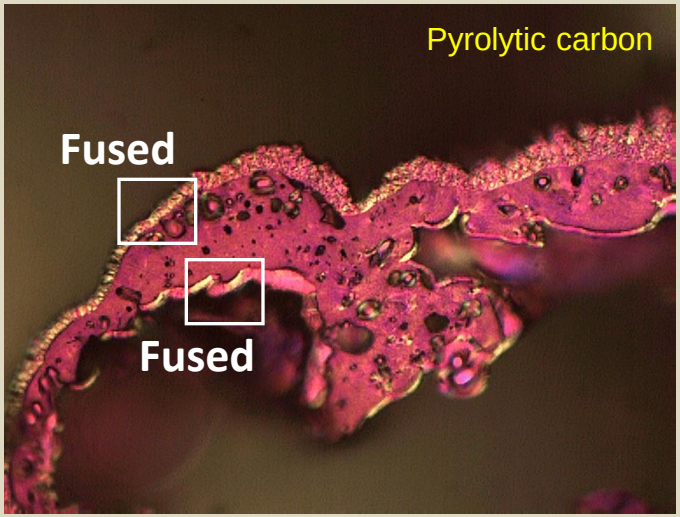
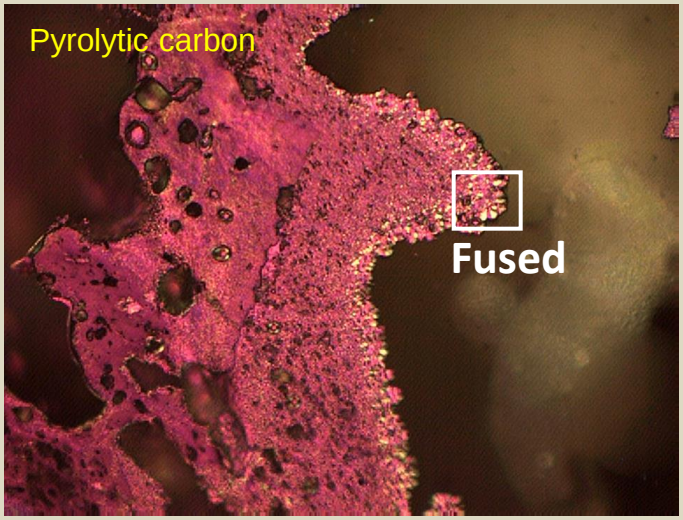
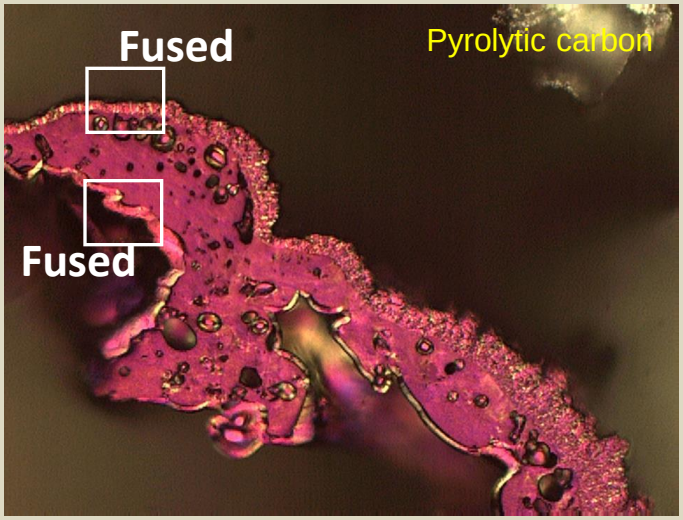
Examples: Optical Character: Fused

Particle field identification →









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To optical character description

To "All levels" slide

PgUp PgDn

Description of the Classification Levels

Level # 3 - Optical Structure of the Fly Ash Carbons:

i) – Dense / Massive
ii)- Porous / Vesiculated

This level of classification of Fly Ash Components is addressed to the particle field identification.

Definitions:

Dense / Massive structure: section of a particle without any porosity or devolatilization pores.

Porous / Vesiculated structure: section of a particle with pores of thermal devolatilization (distorted pores, coalescent pores). Surface particle section (not transformed) with original porosity (cell/cavities structure).

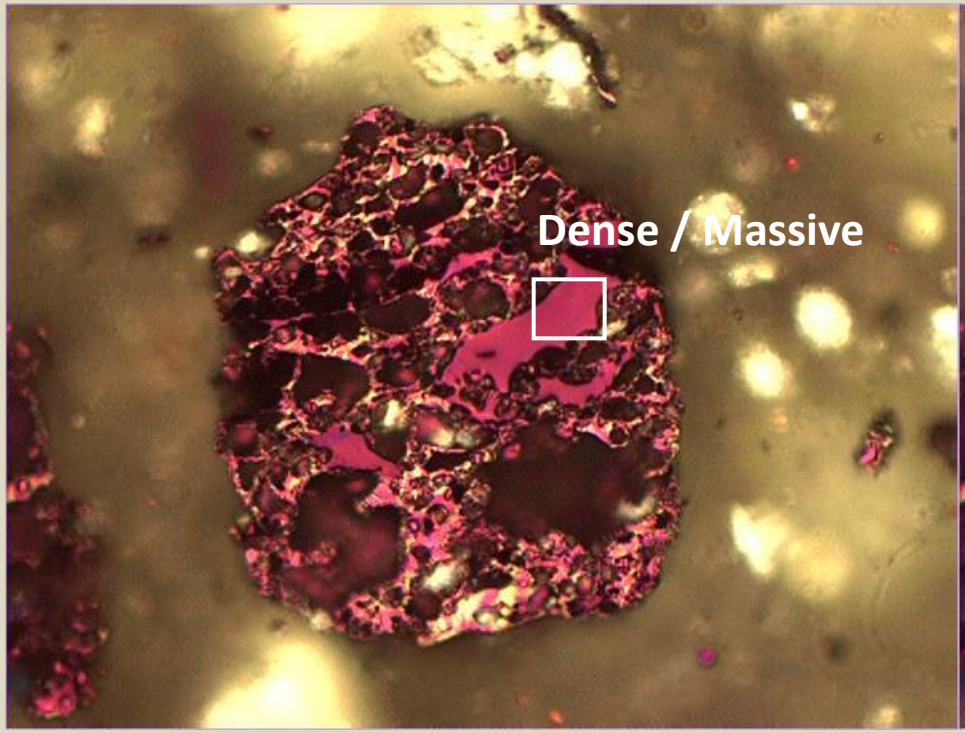
Examples of Dense / Massive and **Porous / Vesiculated structure**

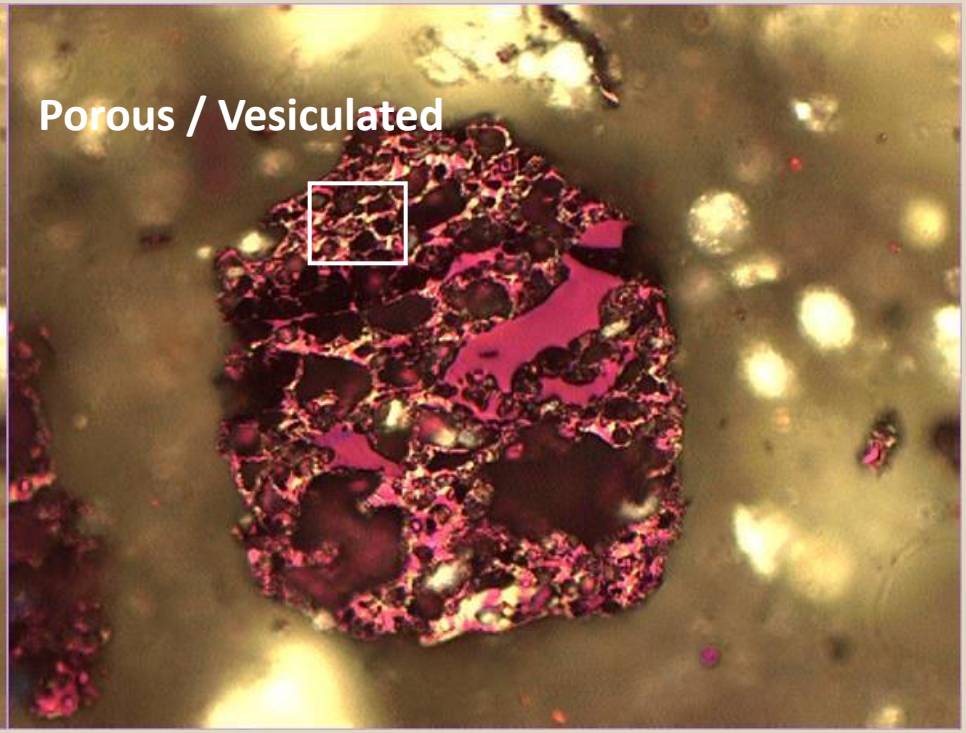
To “All levels” slide

Examples: Optical Structure

Particle field identification →

Level # 3: addressed to the particle surface identification





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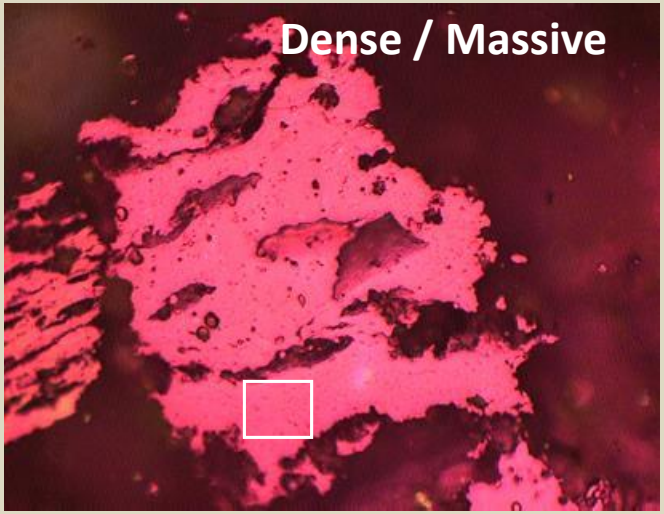
(CLICK HERE FOR MORE EXAMPLES)

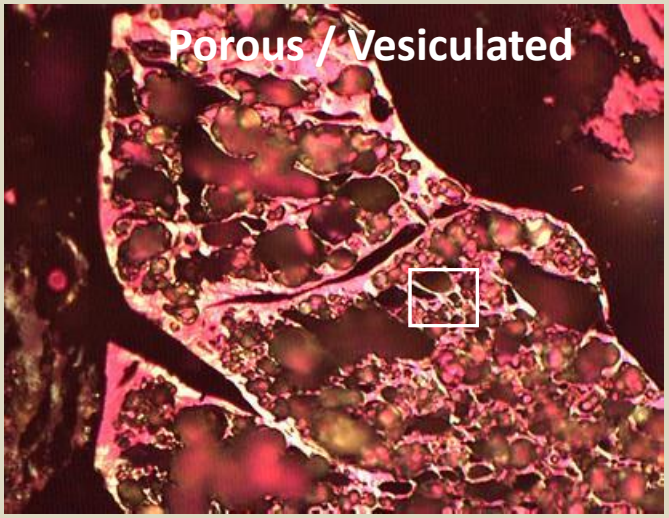
To optical structure description

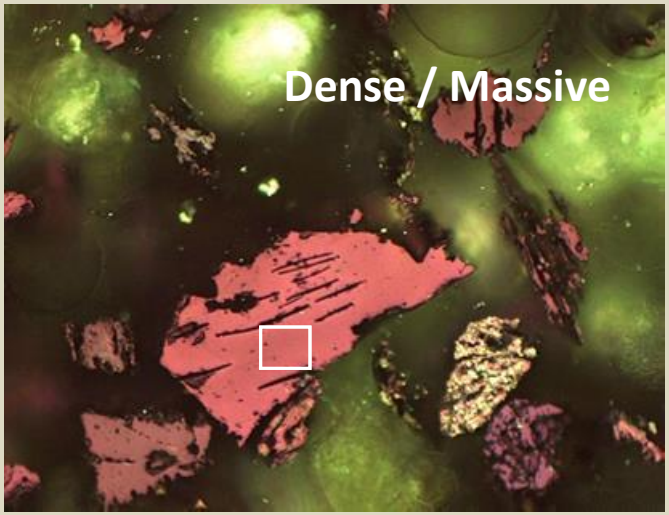
To "All levels" slide

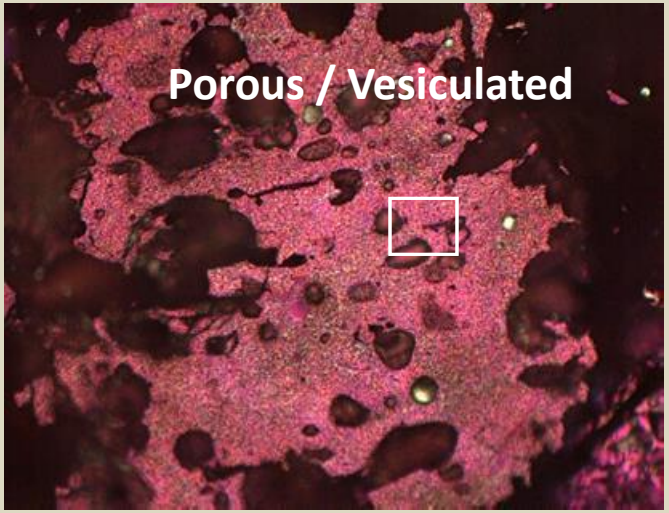
Examples: Optical Structure

Particle field identification →









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To optical structure description

To "All levels" slide

PgUp PgDn

Description of the Classification Levels

Level # 4 - Optical Texture of the Fly Ash Carbons: i) **Isotropic**; ii) **Anisotropic**.

This level of classification of Fly Ash Components is addressed to the particle field identification.

Definitions:

Isotropic texture: section of a particle that does not modify its color or color intensity when it is rotated 360°.

Anisotropic texture: section of a particle that modifies its color or color intensity when it is rotated 360°.

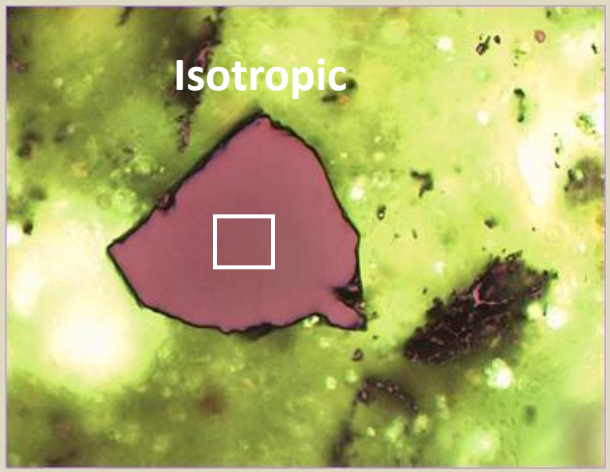
Examples of Isotropic Textures

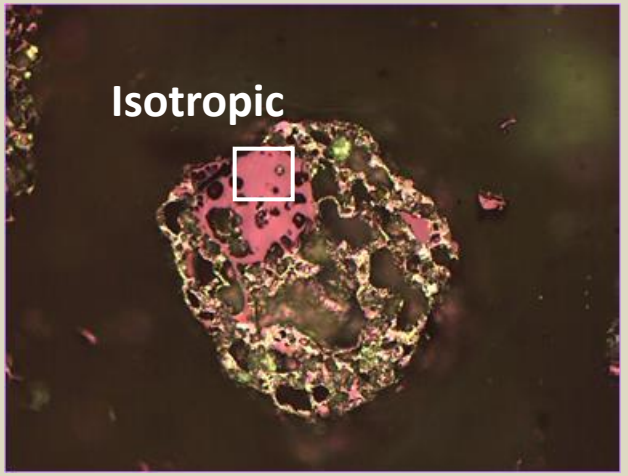
Examples of Anisotropic Textures

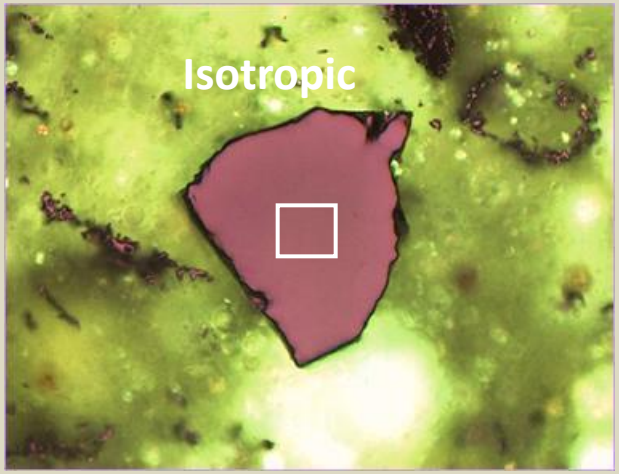
Examples : isotropic optical structure

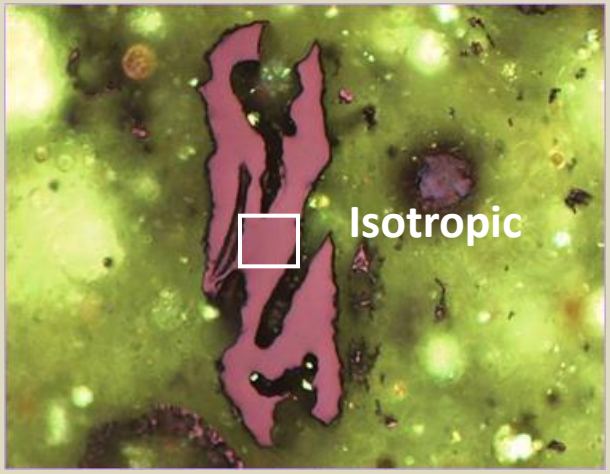
Particle field identification →

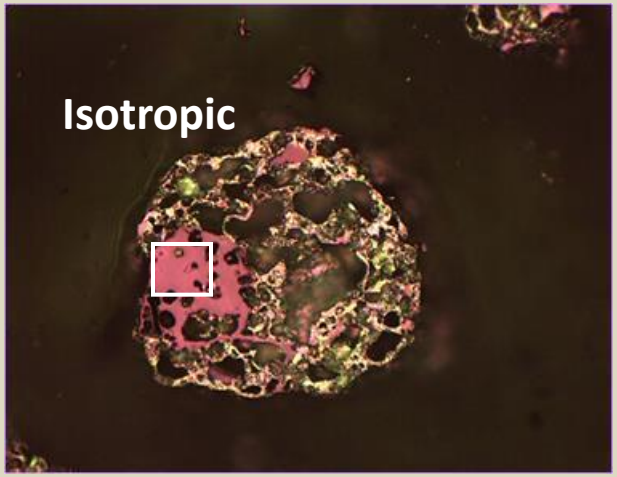
Level # 4: addressed to the particle surface identification











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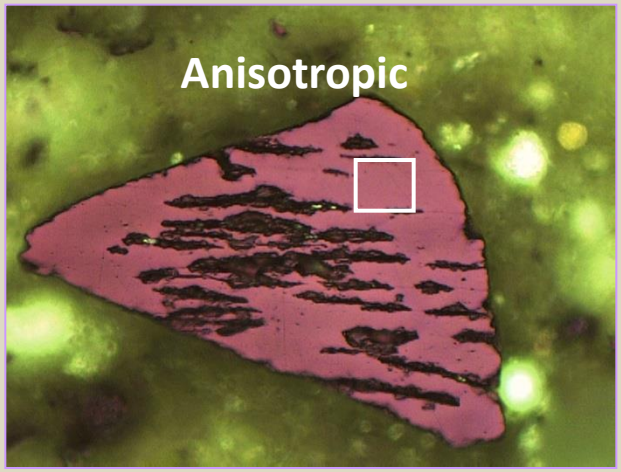
To optical texture description

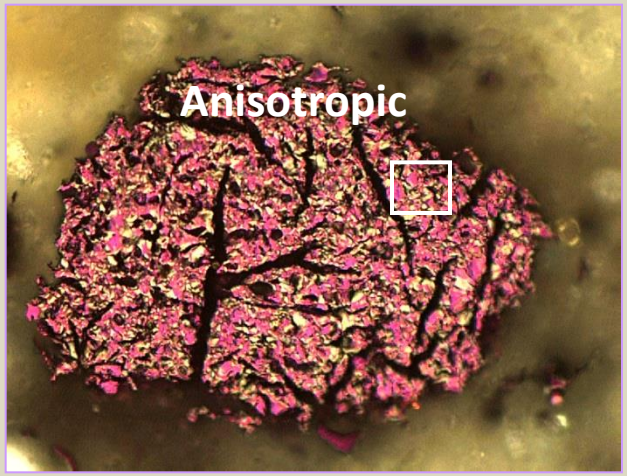
To "All levels" slide

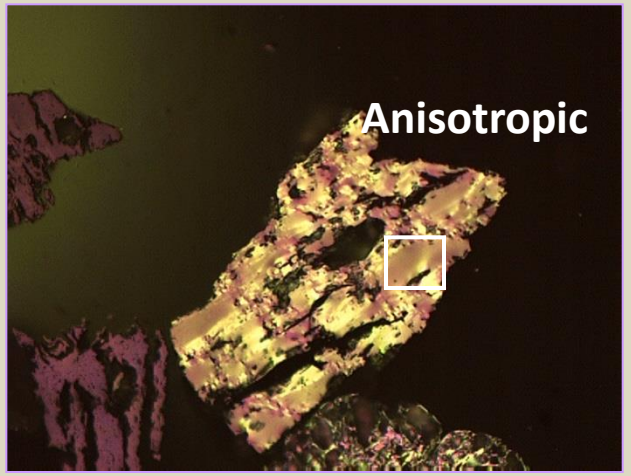
Examples : anisotropic optical structure

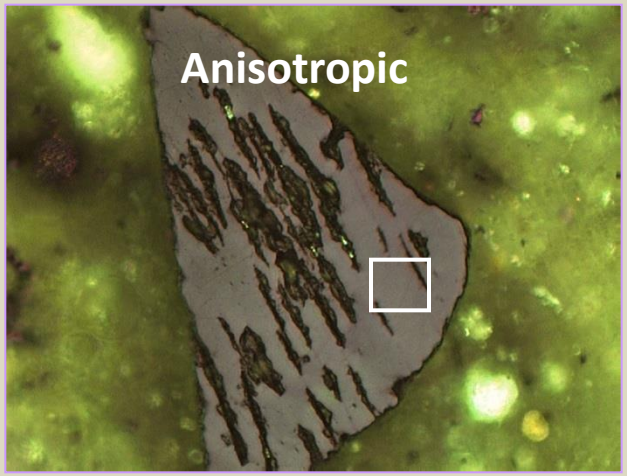
Particle field identification →

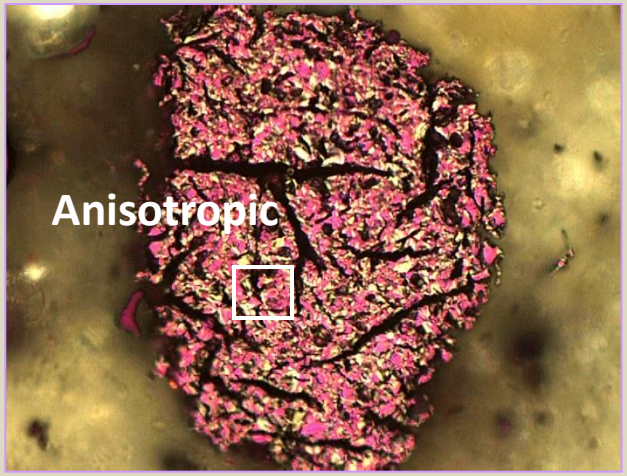
Level # 4: addressed to the particle surface identification

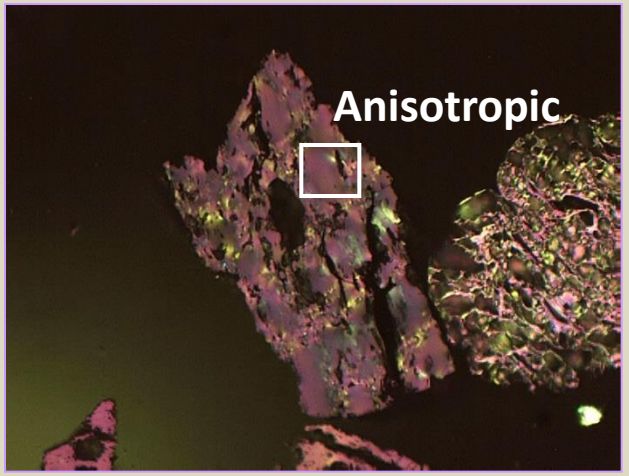












Long side of the pictures: 200 microns

To optical texture description

To "All levels" slide

Description of the Classification Levels

Level # 5 – Origin / Provenance of the Fly Ash Carbons:

i) - **Coal**
ii) - **Biomass**
iii) - **Pet coke ("petroleum coke")**
iv) - **Other (ex. sawdust, tires)**

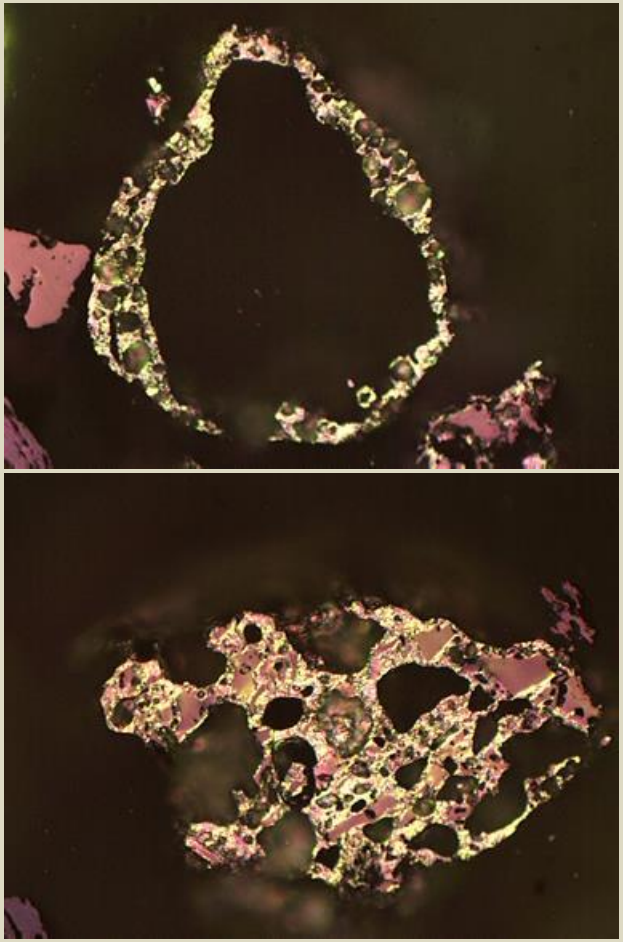
This level of classification of Fly Ash Components is addressed to the whole particle.

Examples of Origin / Provenance

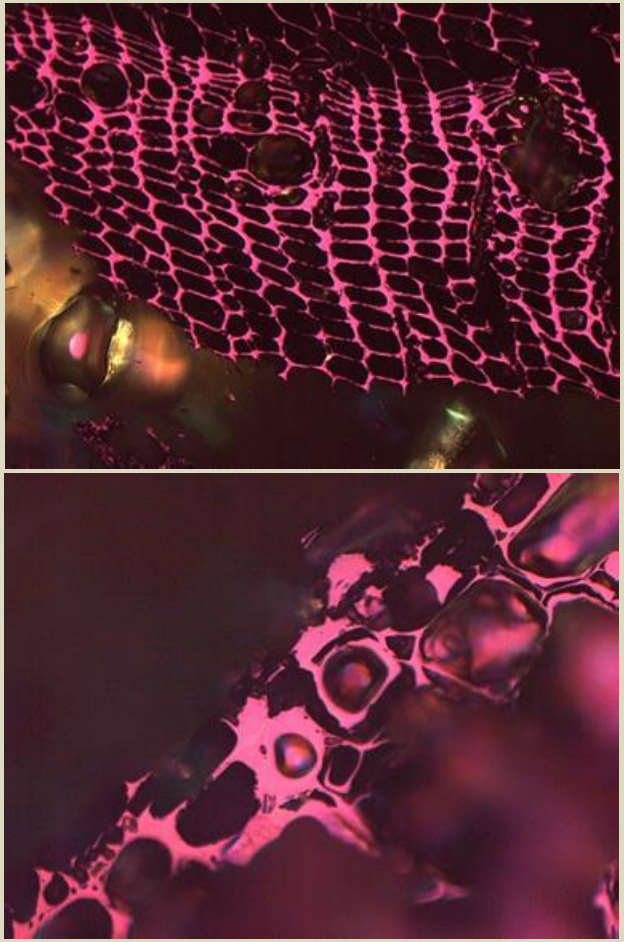
To “All levels” slide

Examples: Origin / Provenance

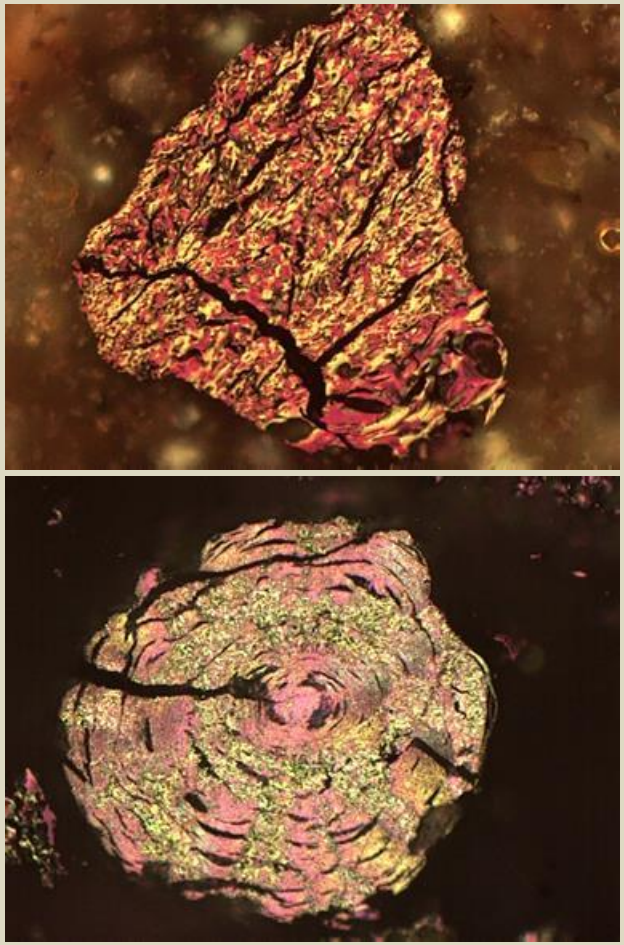
From Coal



From Biomass



From Pet coke



Long side of the pictures: 200 microns

To Origin / Provenance description

To “All levels” slide

PgUp PgDn

Description of the Classification Levels

Level # 6 – Type of Particle.

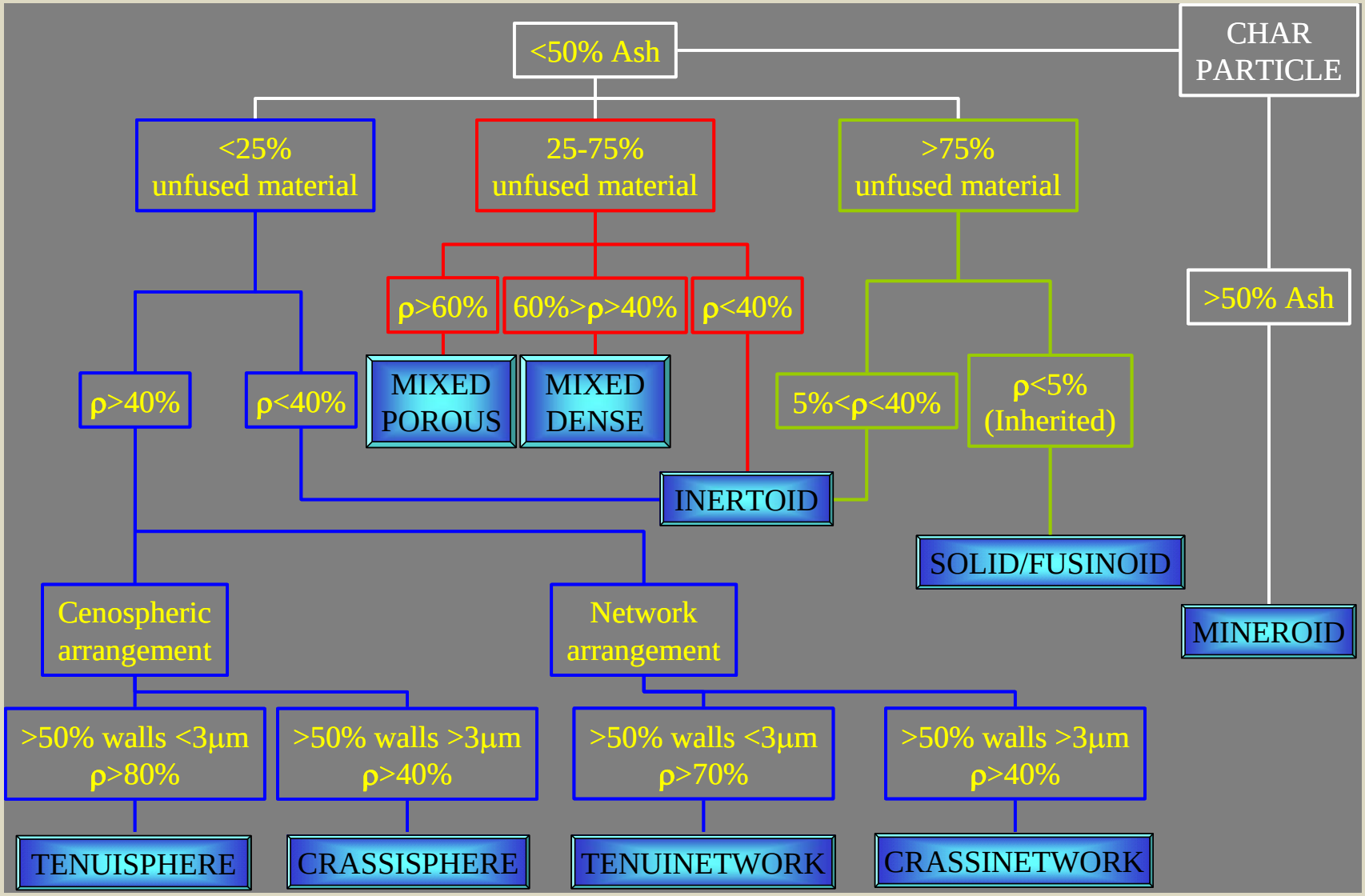
Apply the ICCP Char Classification

(From the Combustion Working Group-ICCP; Lester & Alvarez Convenors)

This level of classification of Fly Ash Components is addressed to the whole particle.

Examples of Particle Types

ICCP Char Classification



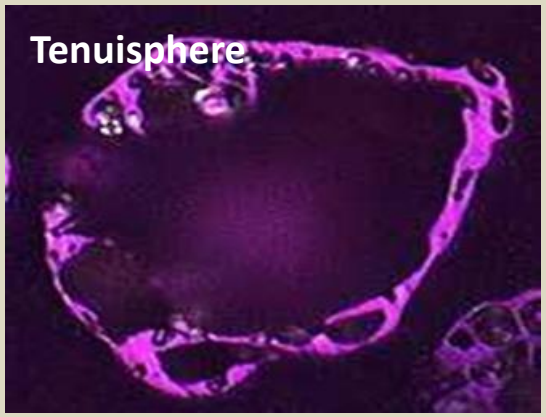
(From the Combustion Working Group-ICCP; Lester & Alvarez Convenors)

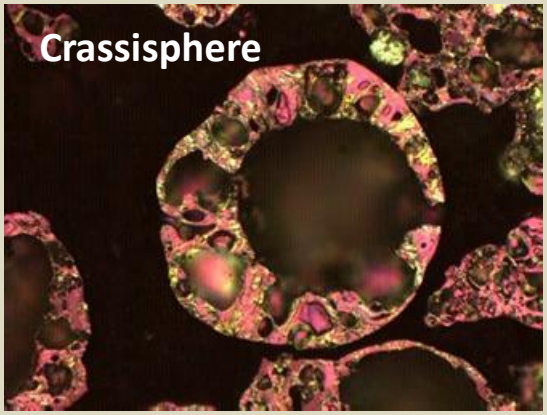
To type of particle description

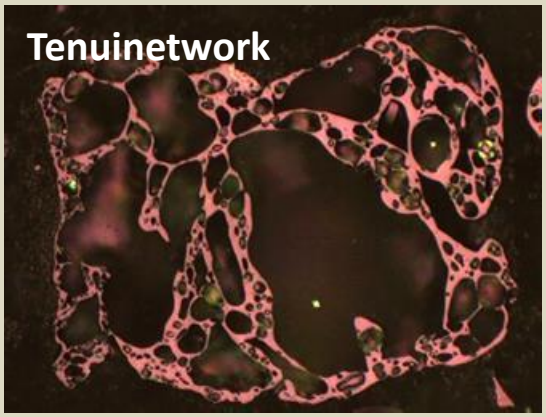
To all levels slide

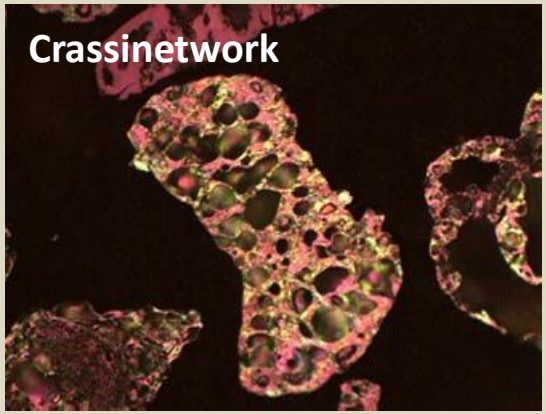
PgUp PgDn

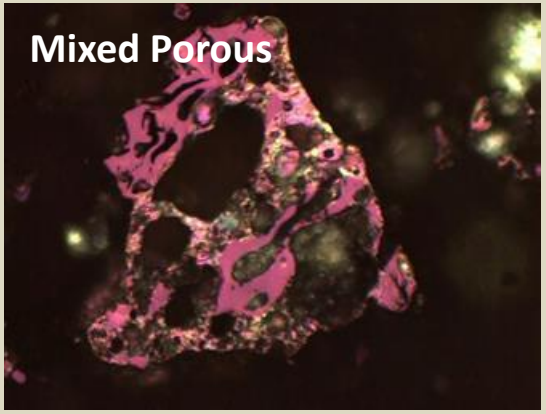
Examples of Particle Types

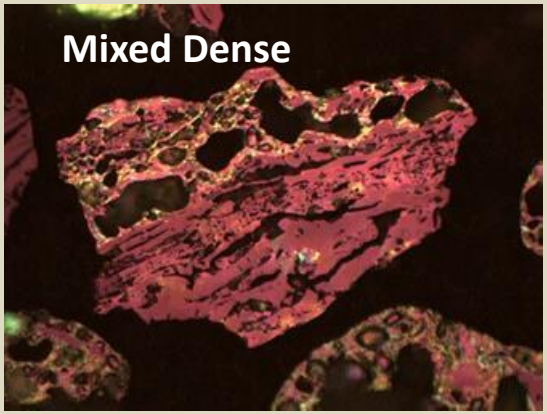


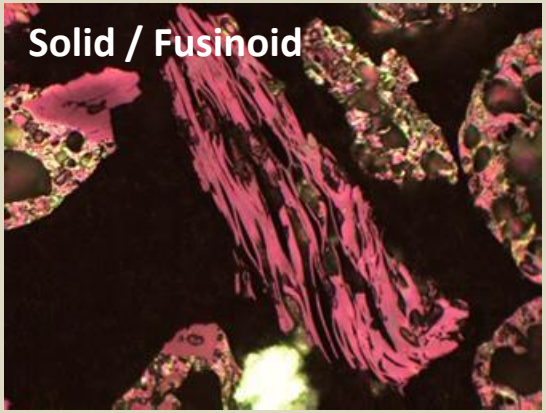


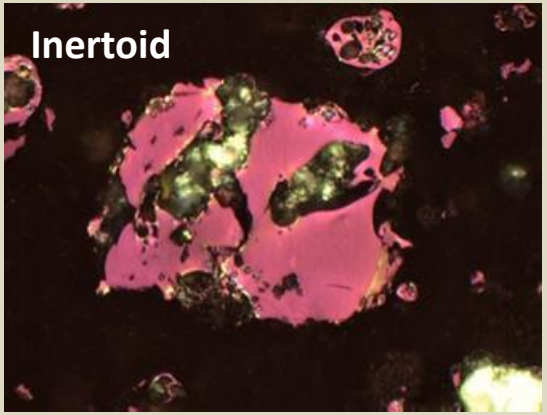


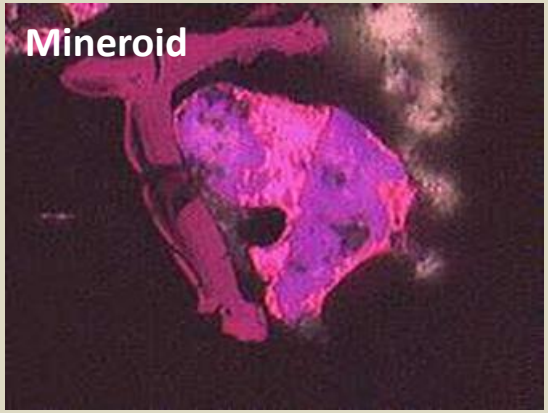












Images from the Char Classification Atlas - ICCP

To type of particle description

To “All levels” slide

PgUp PgDn

Petrographic Classification of Fly Ash Components

Organization of the Photomicrographs

The images of Fly Ash Components included in this Atlas have been organized according to the **type of combustion**, the **main feed fuel** originating the Fly Ash and the **nature of the Fly Ash Component** (organic-unburned carbon, inorganic).

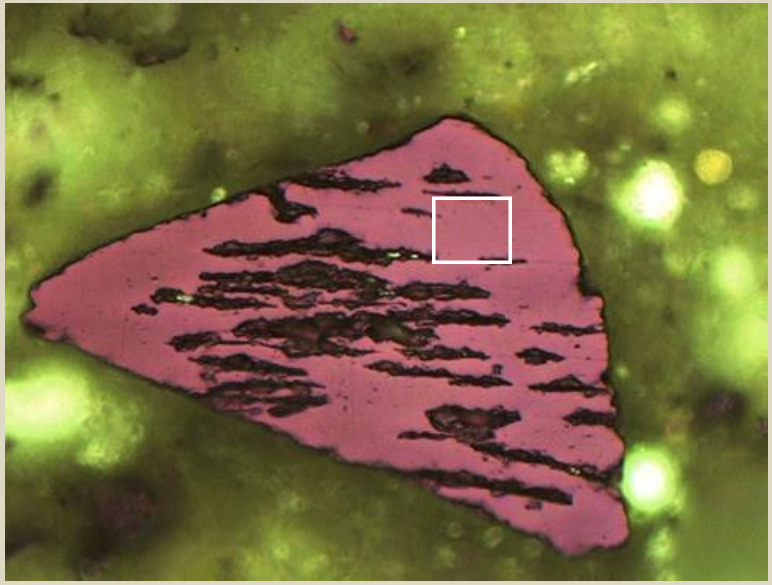
All the images (pair of images of the same Fly Ash Component in two different positions) are identified and classified following the Petrographic Fly Ash Classification (2012) previously described.

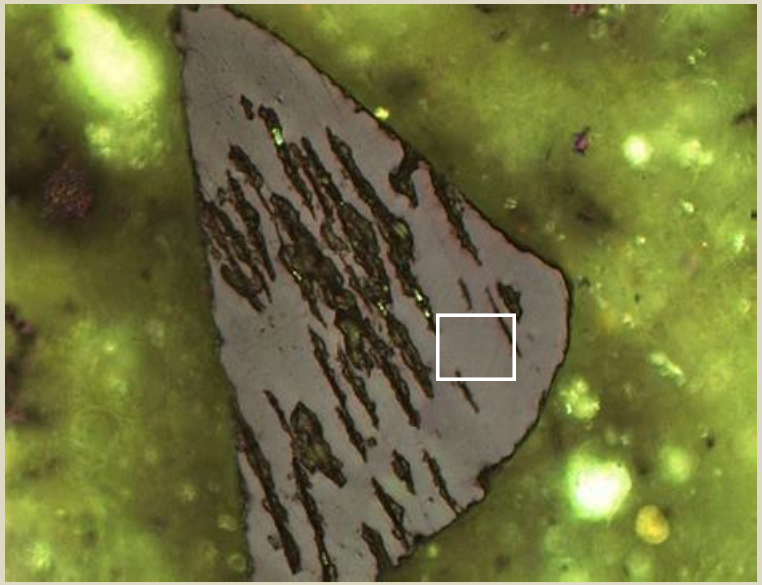
Example 

ICCP exercises (2007 and 2009) image number

Example: Pulverized Coal Combustion (PCC)

Unburned Carbon





Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (High rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Solid**

Long side of the pictures: 200 microns

To Organization of the Photomicrographs

PgUp PgDn

ATLAS Index

PULVERIZED COAL COMBUSTION: FLY ASH CARBONS
FLY ASH INORGANICS

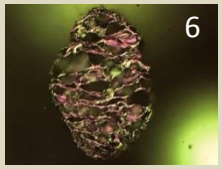
STOKER BOILER: FLY ASH CARBONS
FLY ASH INORGANICS

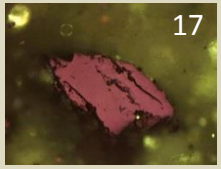
FLUIDISED BED COMBUSTION: FLY ASH CARBONS
FLY ASH INORGANICS

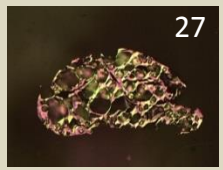
OTHERS (*ex.*, Sawdust, tires)

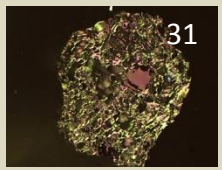
PULVERIZED COAL COMBUSTION: Fly ash carbons

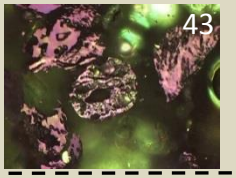
Origin: High Rank Bituminous Coal

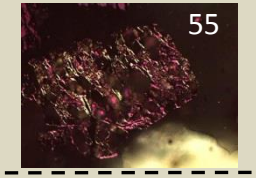




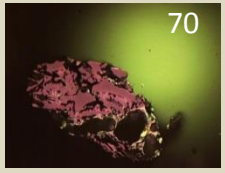


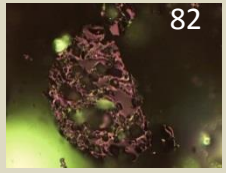


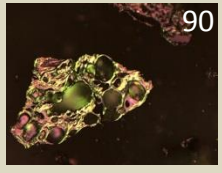


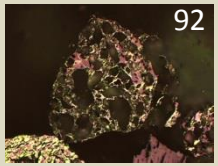


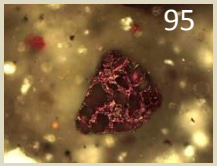
Origin: Medium Rank Bituminous Coal

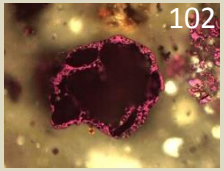


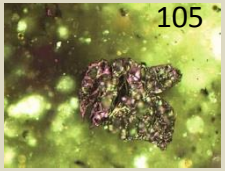


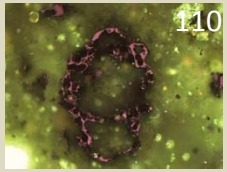


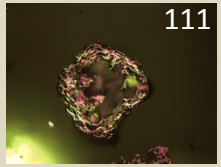




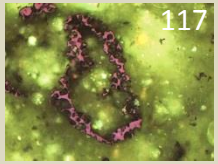


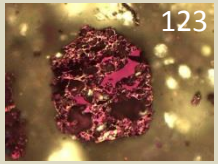


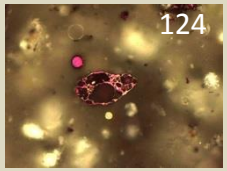


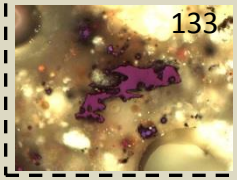


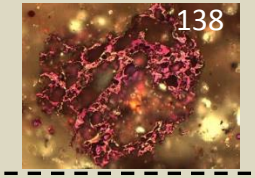
Origin: Low Rank Bituminous Coal

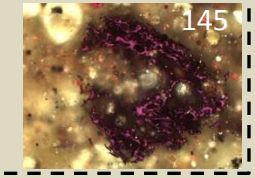






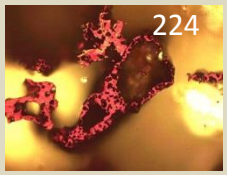


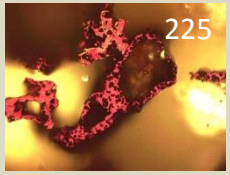


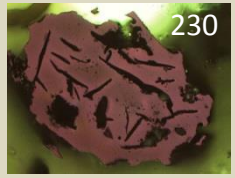


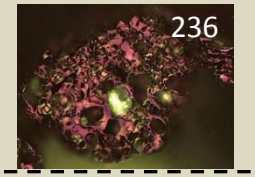
Origin: Coal blend + Pet coke

Origin: Coal blend + Biomass







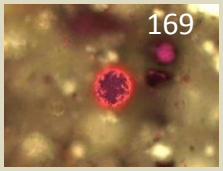


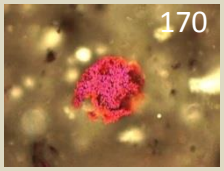
Long side of the pictures: 200 microns

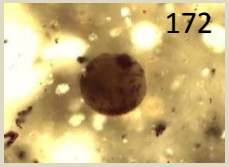
PULVERIZED COAL COMBUSTION: Fly ash inorganics

Origin: High Rank Bituminous Coal

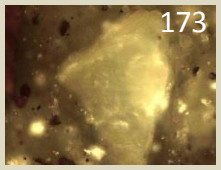
Origin: Medium Rank Bituminous Coal

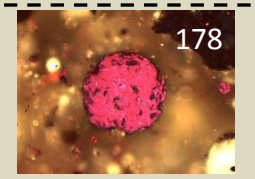


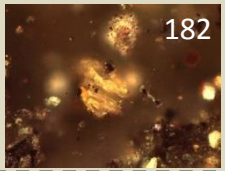


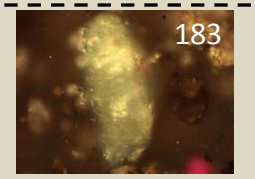


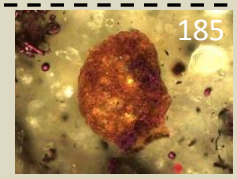
Origin: Low Rank Bituminous Coal

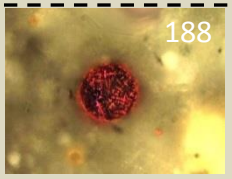




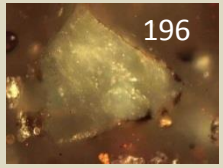


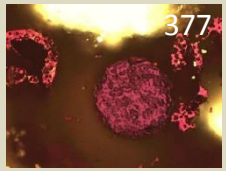


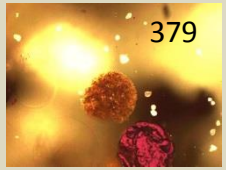


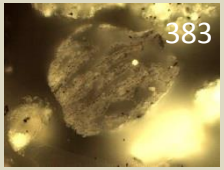


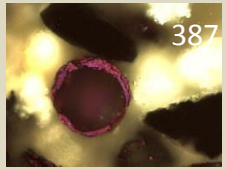
Origin: Coal blend + Biomass

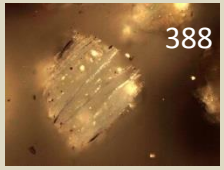








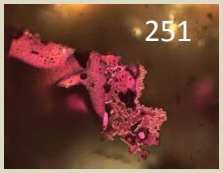


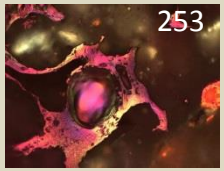


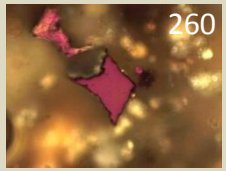
Long side of the pictures: 200 microns

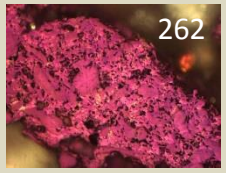
Origin: Medium Rank Bituminous Coal

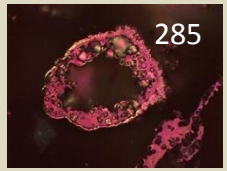
STOKER BOILER: Fly ash carbons

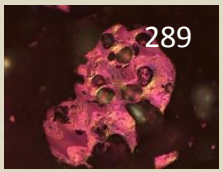


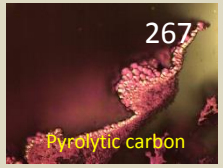


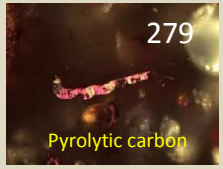




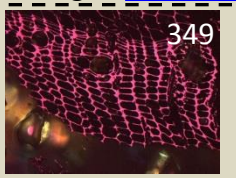


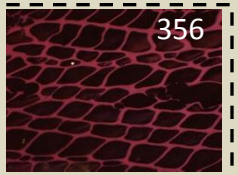






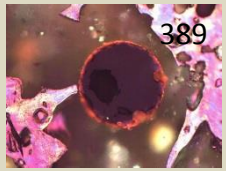
Origin: Biomass (Eucalyptus)

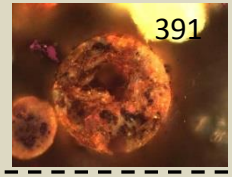


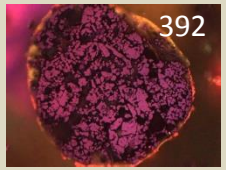


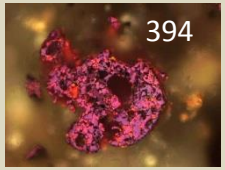
Origin: Medium Rank Bituminous Coal

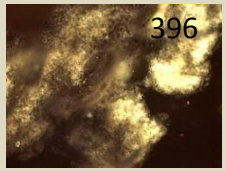
STOKER BOILER: Fly ash inorganics



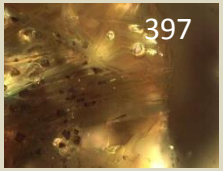


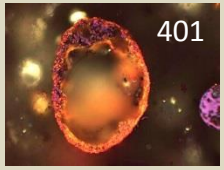


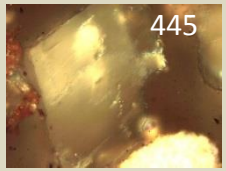


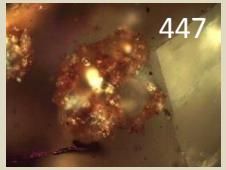


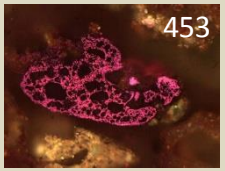
Origin: Forest biomass (*Eucalyptus Globulus Bark*)

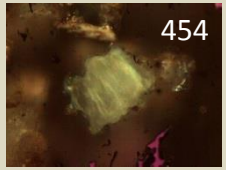


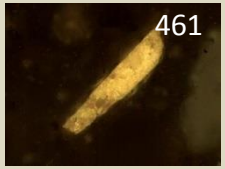


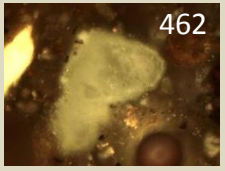


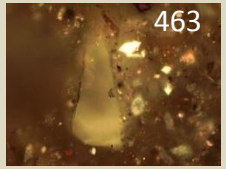


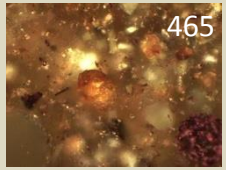


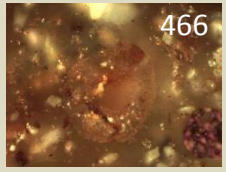






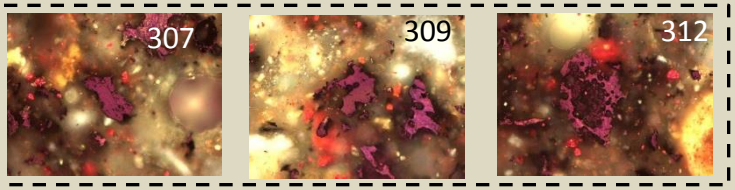




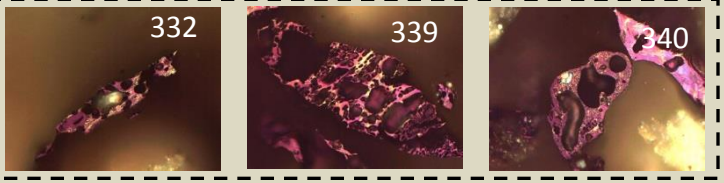


Fluidised Bed Combustion: Fly ash carbons

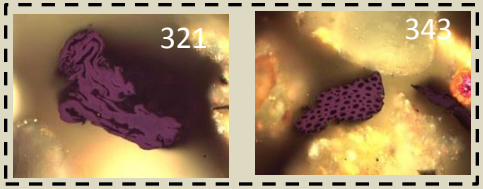
Origin: Medium Rank Bituminous Coal



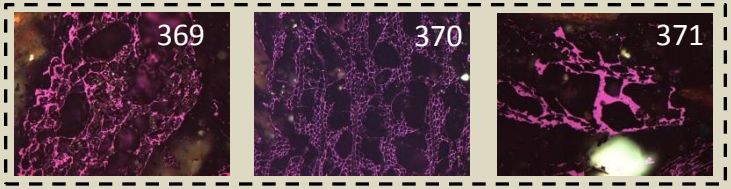
Origin: Coal tailings + Biomass (wood pellets)



Origin: Biomass (wood pellets)



Origin: Biomass (Eucalyptus)



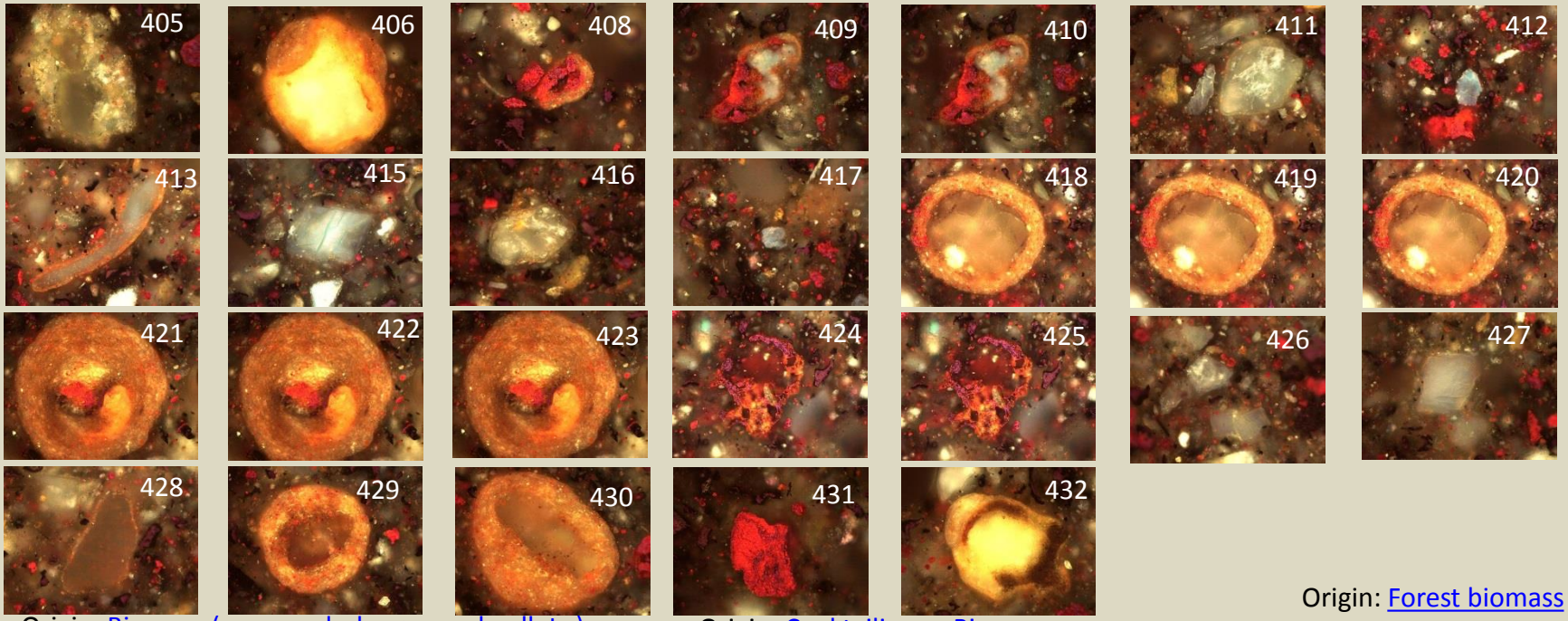
Long side of the pictures: 200 microns

OTHER: Fly ash carbons

Origin: Biomass (SAWDUST)

Fluidised Bed Combustion: Fly ash inorganics

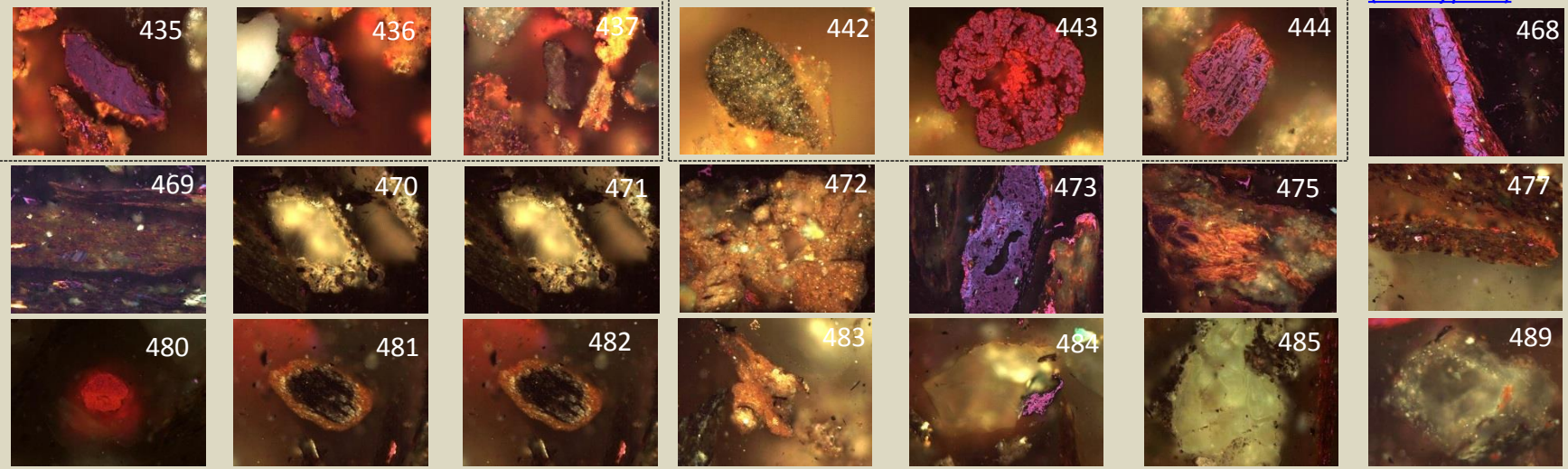
Origin: Medium Rank Bituminous Coal



Origin: Biomass (sewage sludge + wood pellets)

Origin: Coal tailings + Biomass

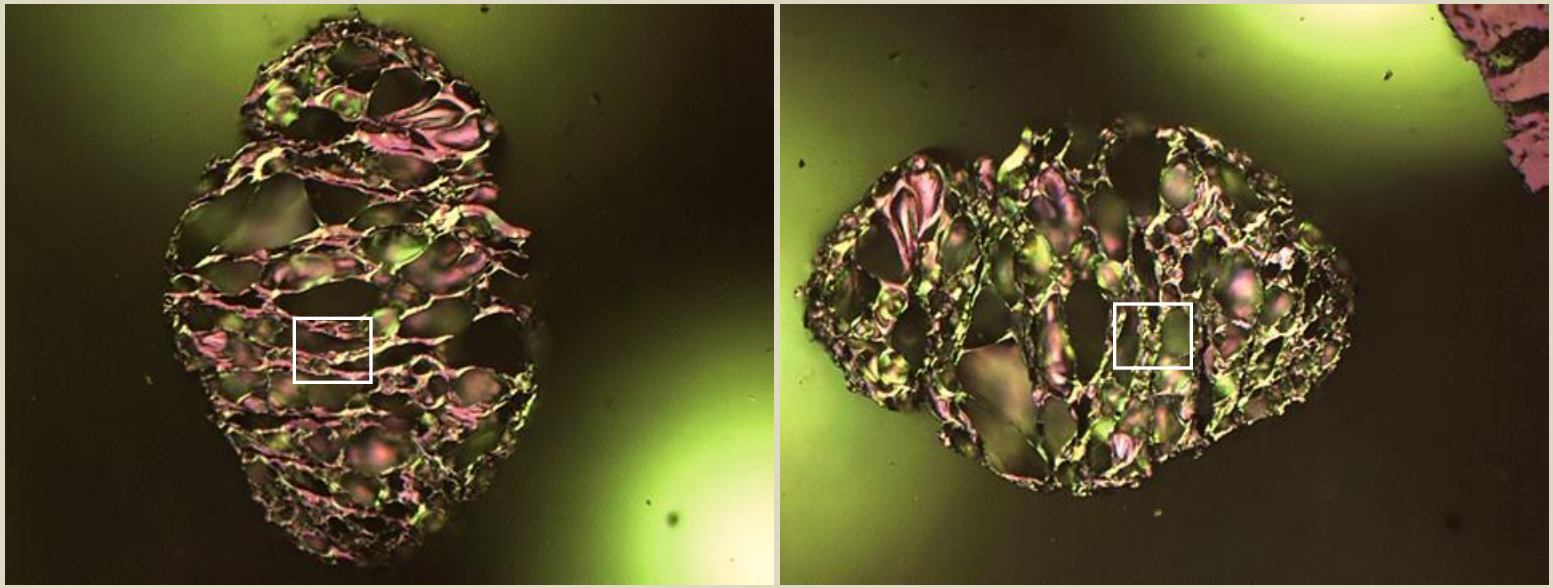
Origin: Forest biomass (*Eucalyptus*)



Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon

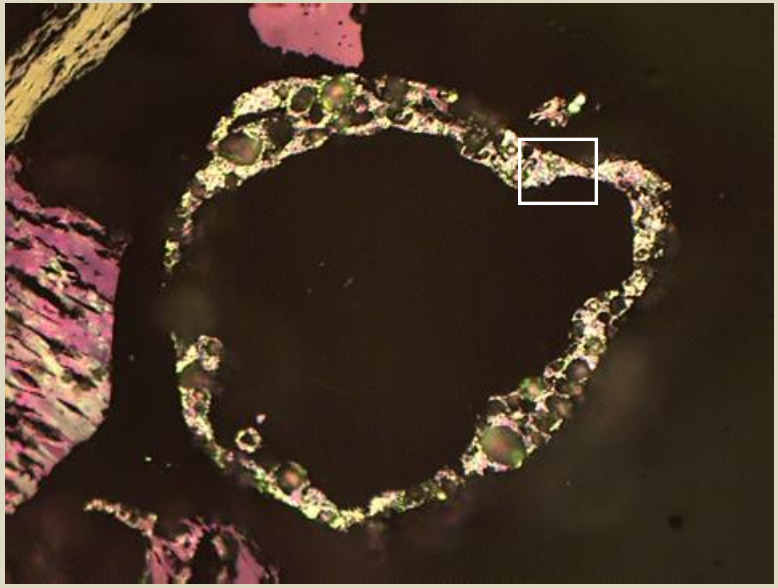


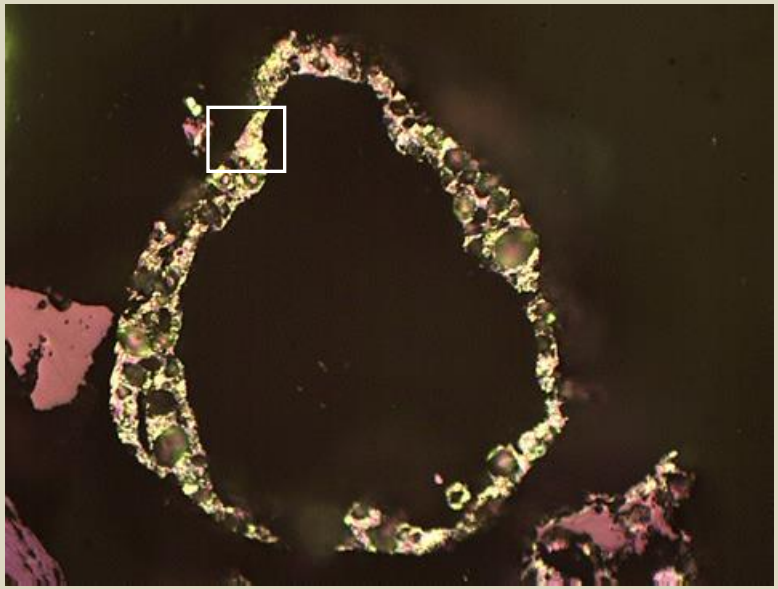
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (High rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Tenuinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



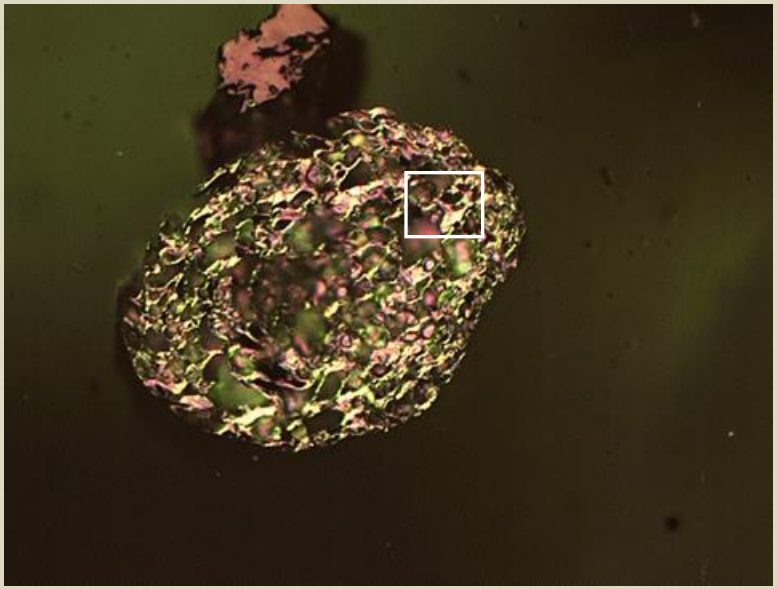


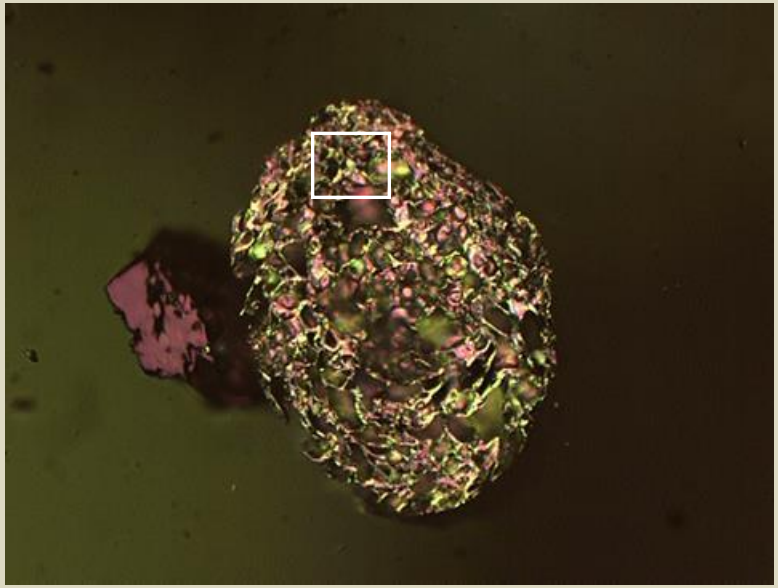
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (High rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Tenuisphere**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



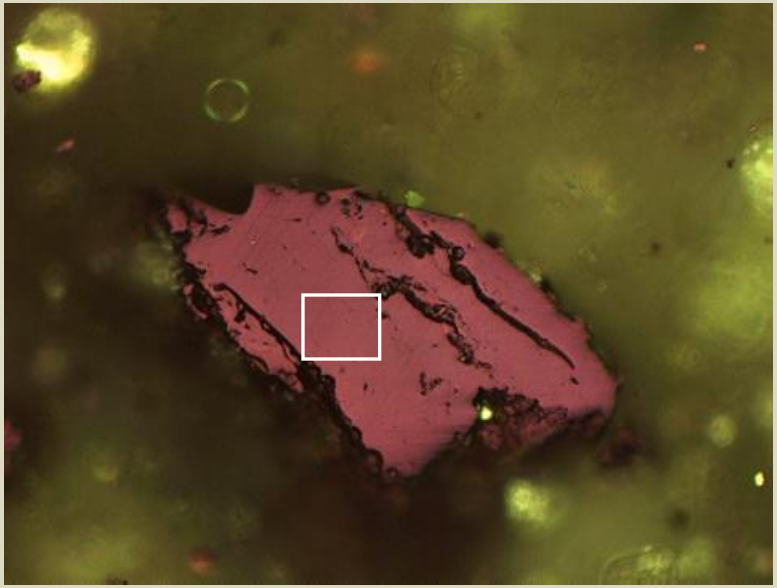


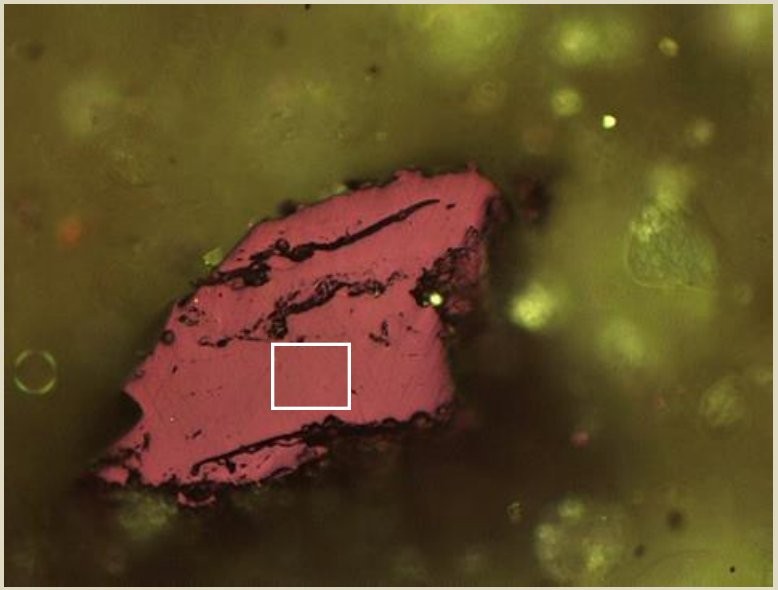
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (High rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Tenuinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



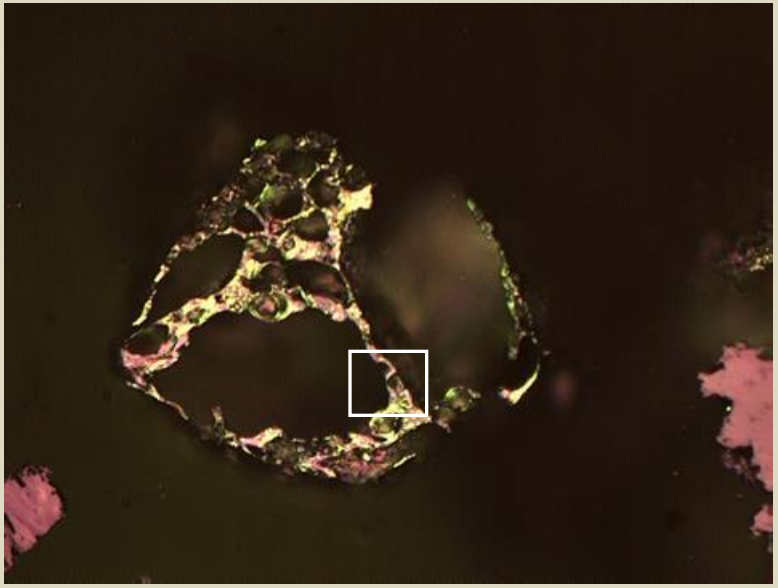


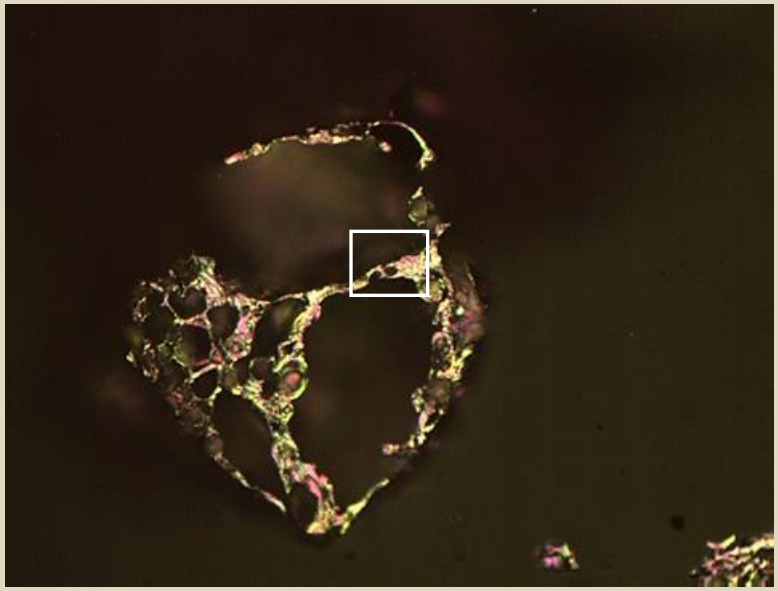
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal (High rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Solid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



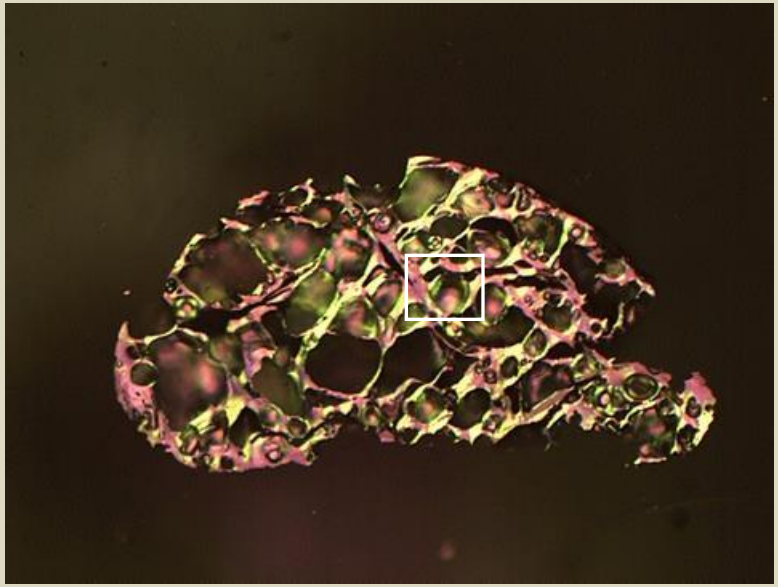


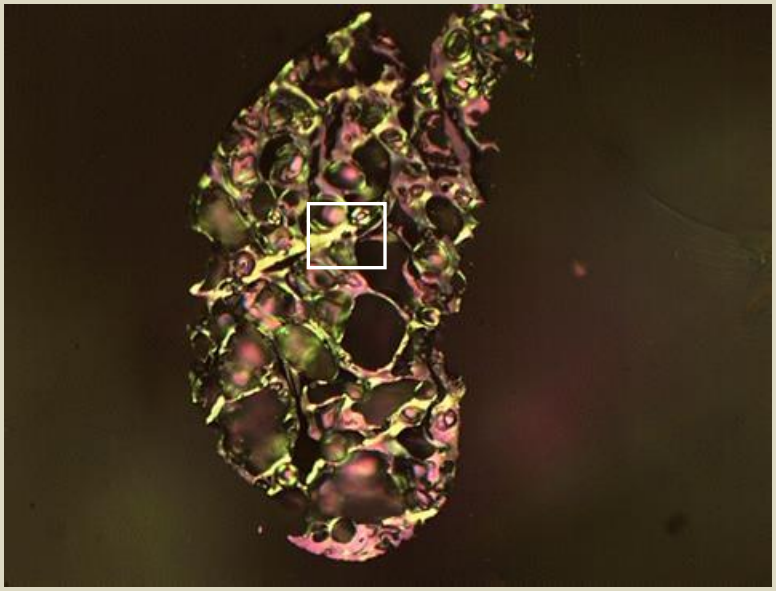
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (High rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Tenuinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



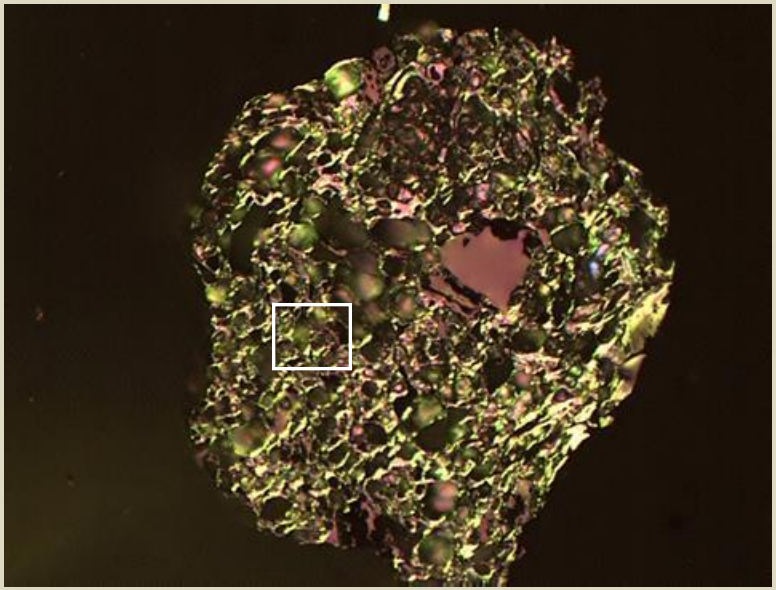


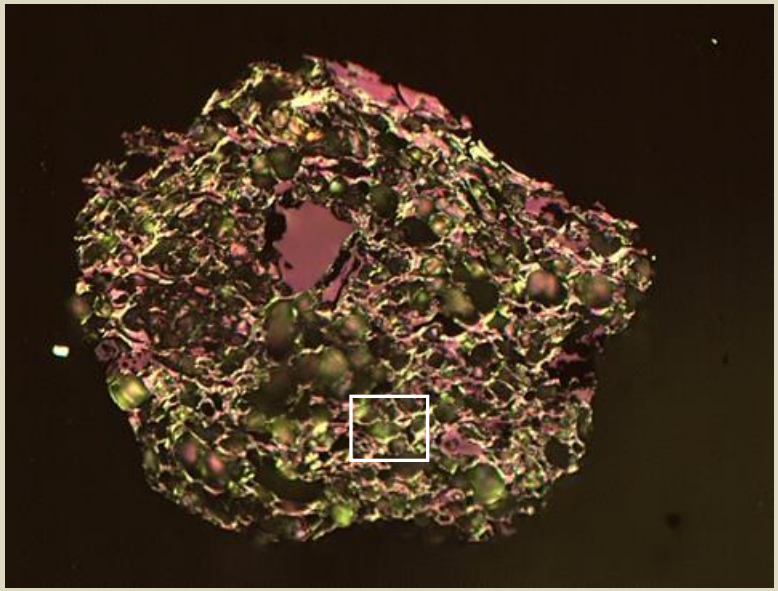
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (High rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Tenuinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



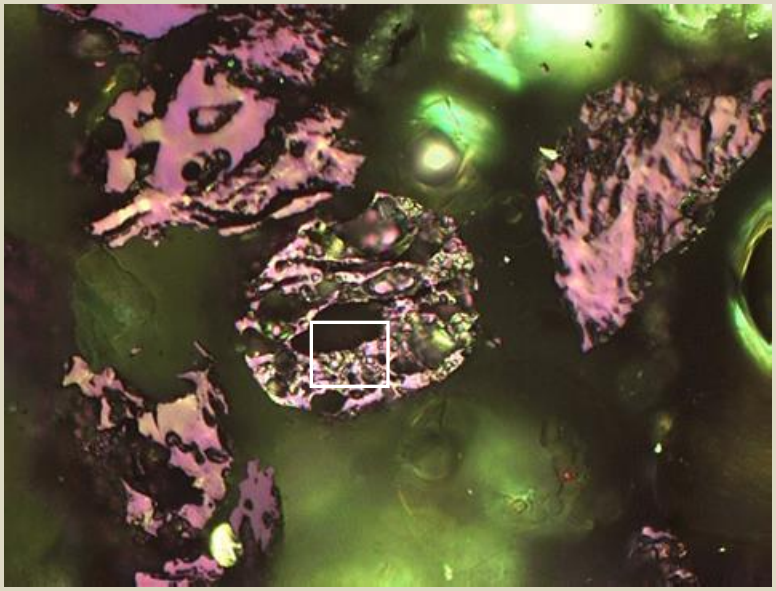


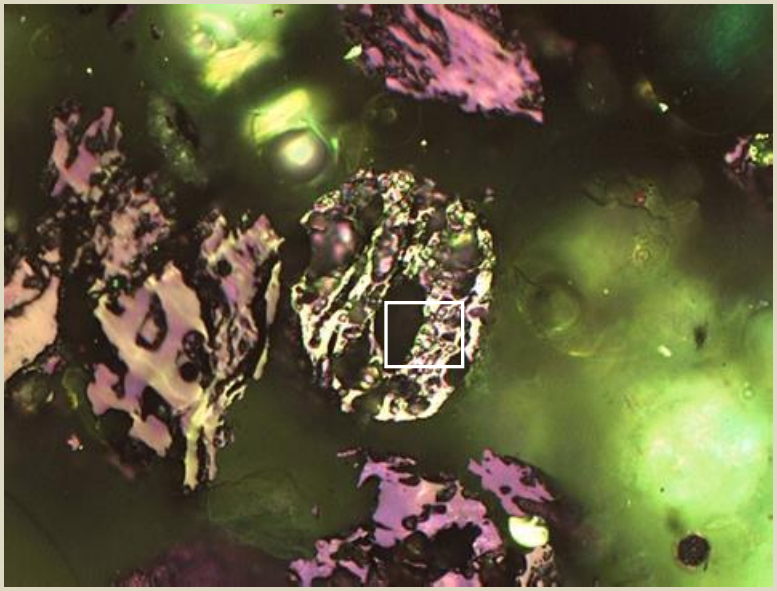
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**fused**
Level # 3- Structure/Morphology: particle field identification:	**porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (High rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Tenuinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



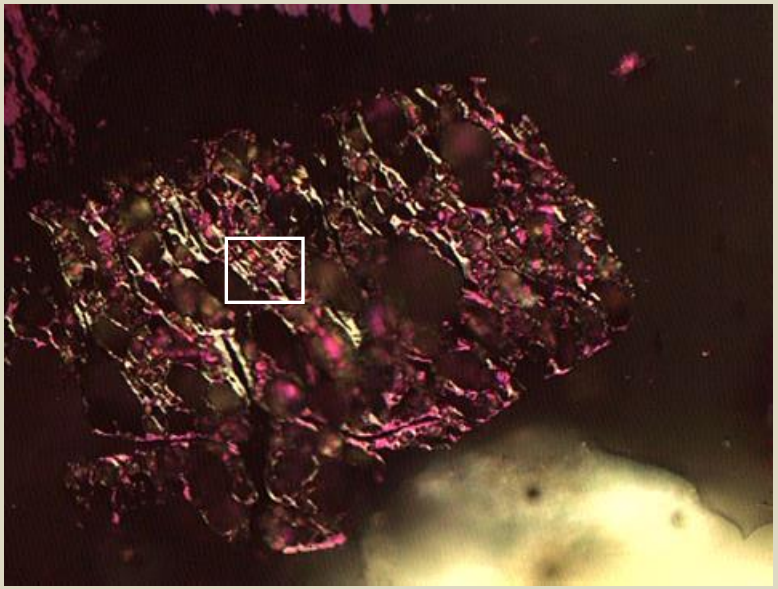


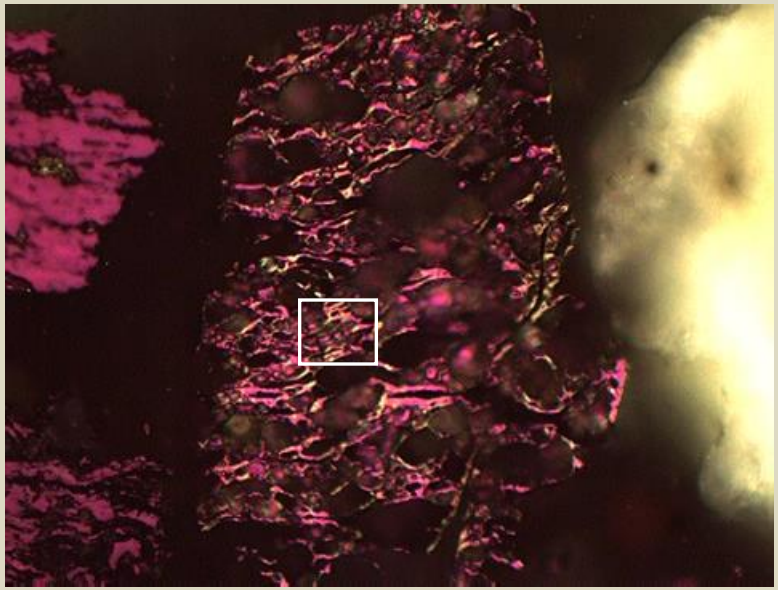
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (High rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Tenuinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



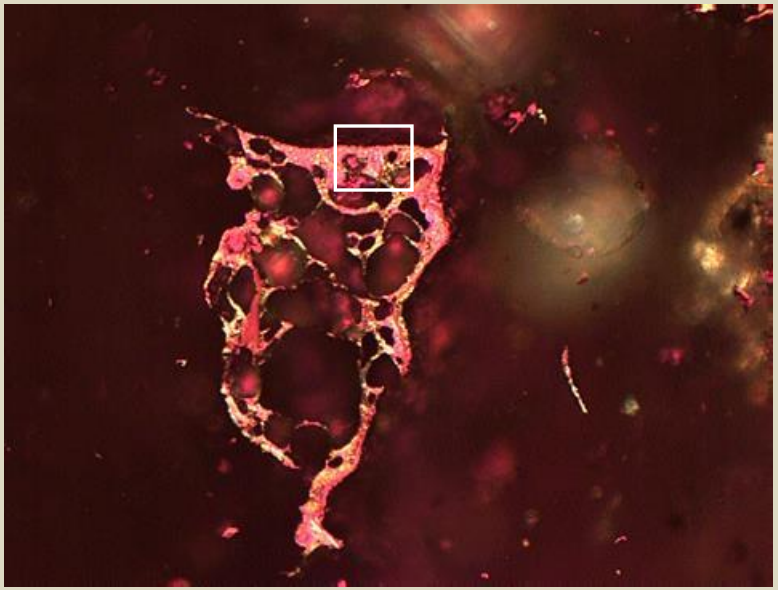


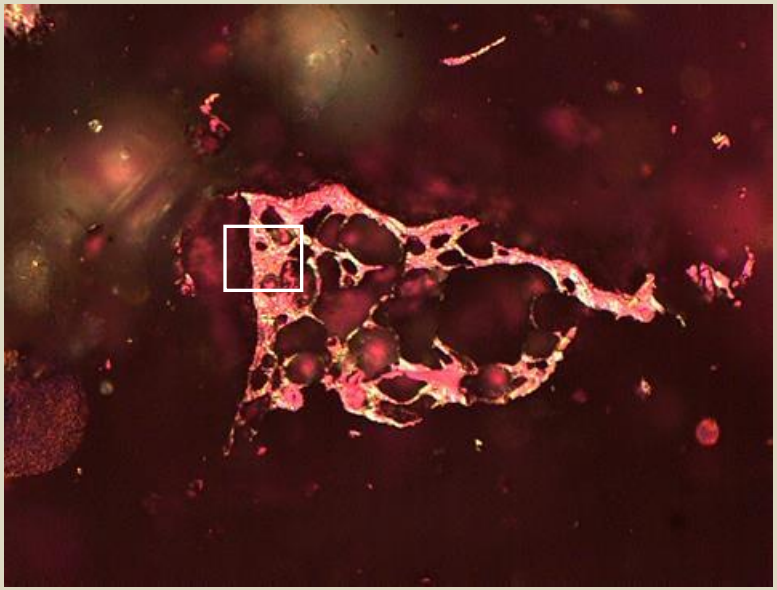
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (High rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Tenuinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



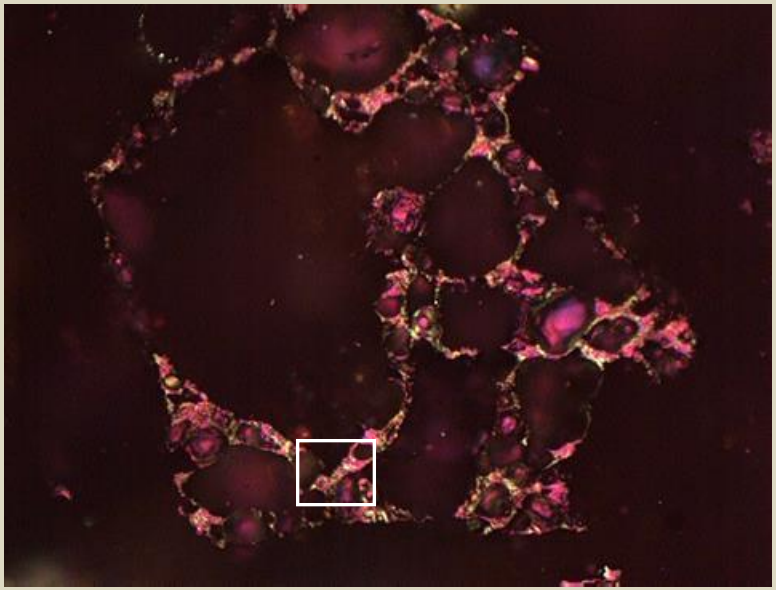


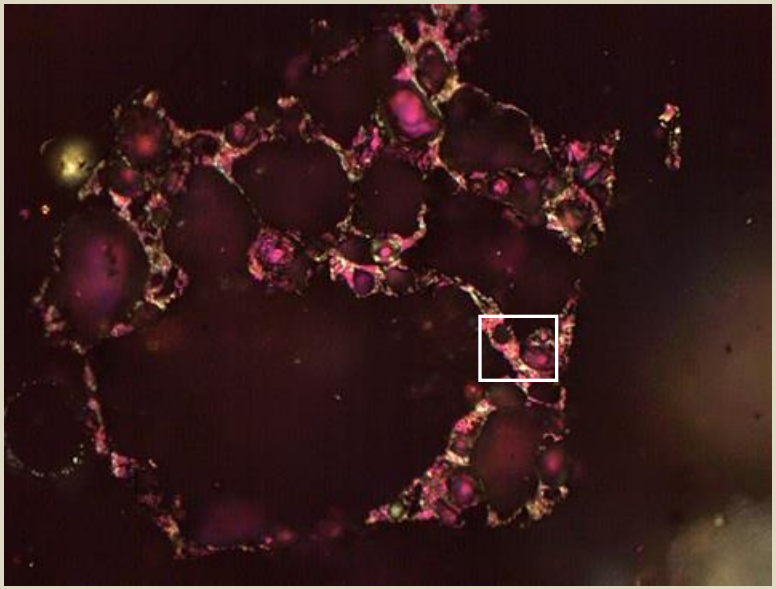
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (High rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Tenuinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



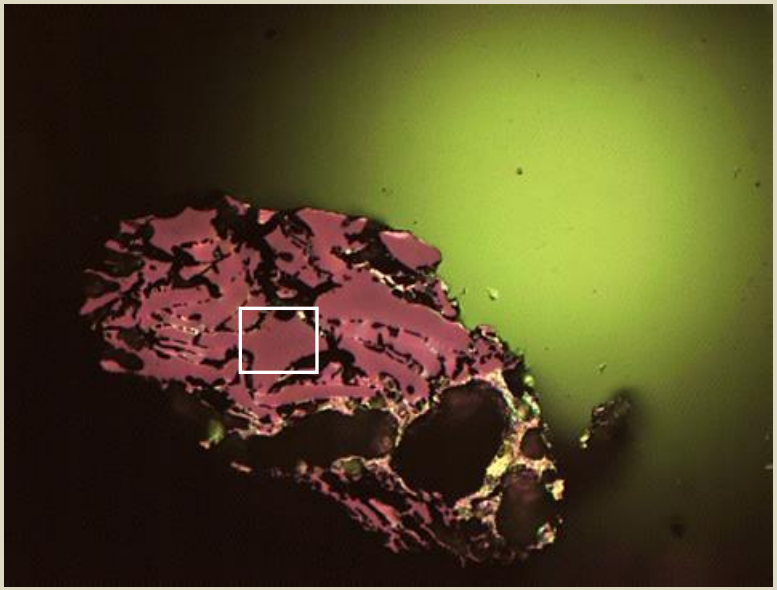


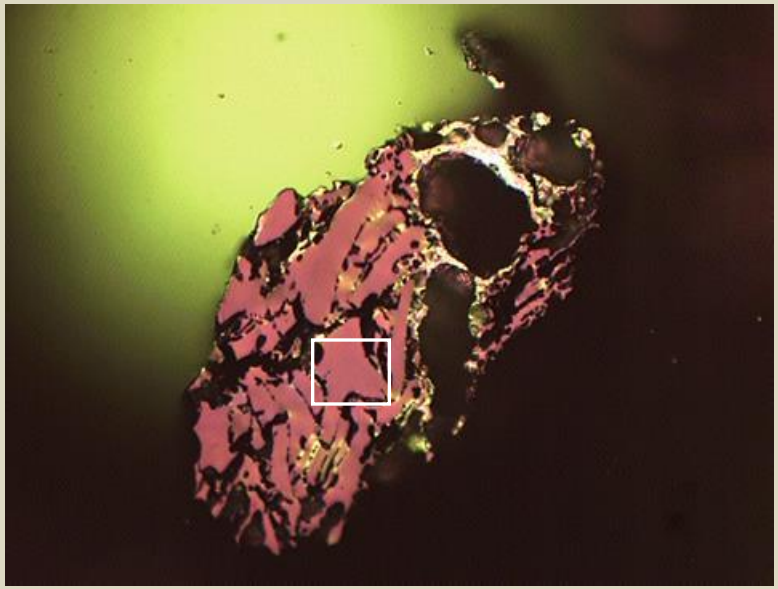
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (High rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Tenuinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



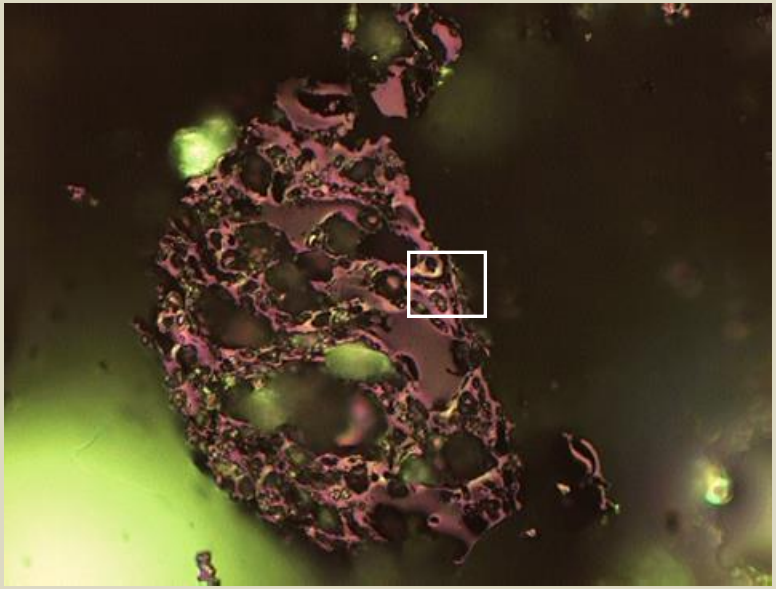


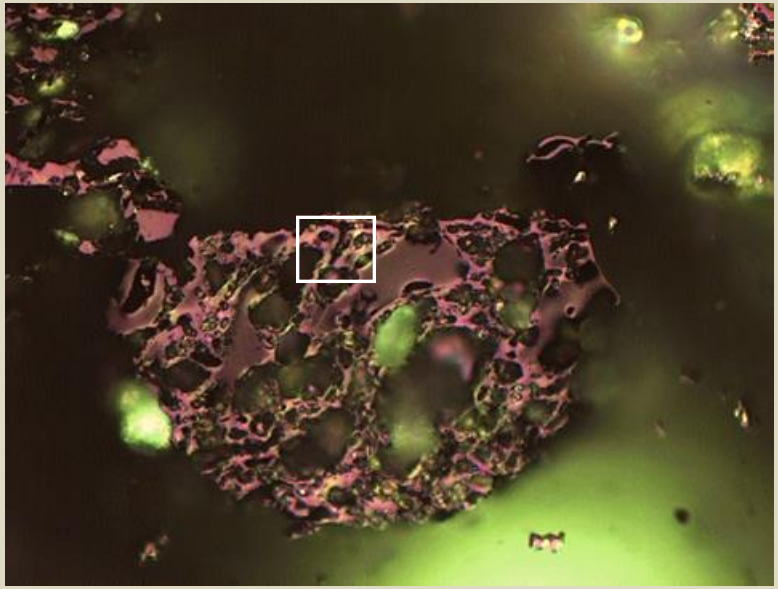
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Inertoid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



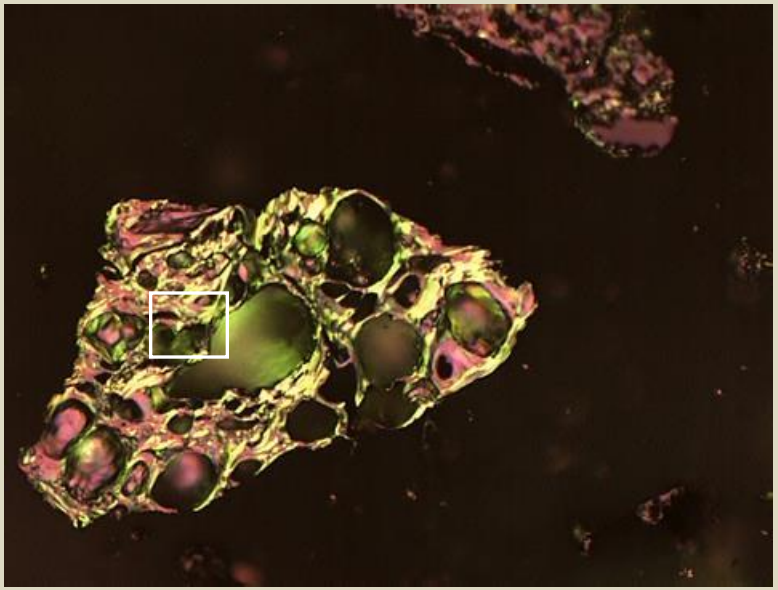


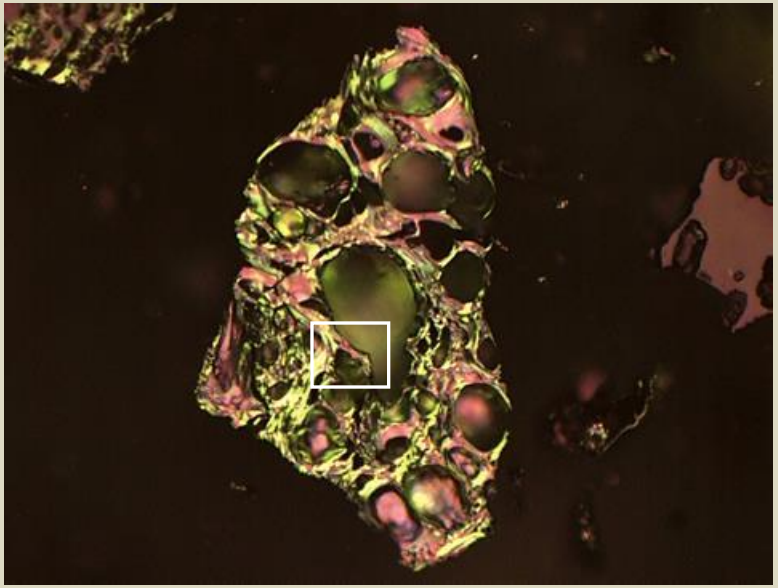
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Mixed porous**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



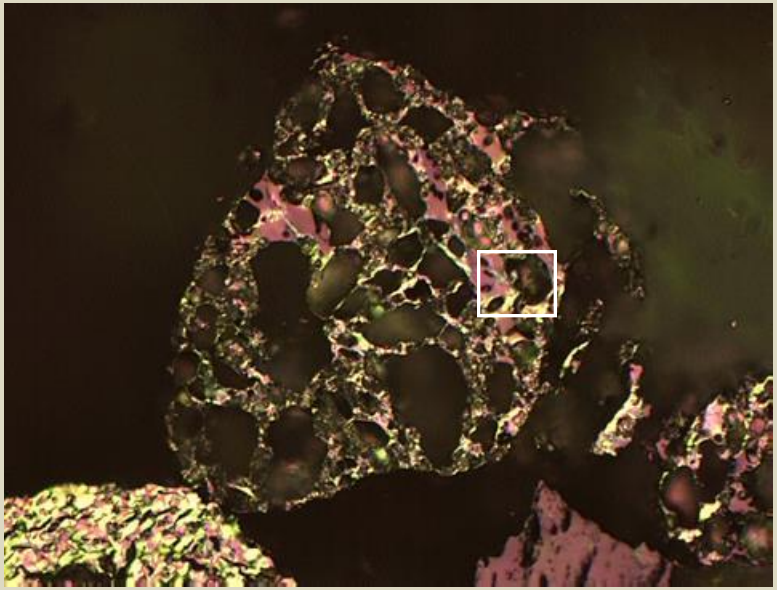


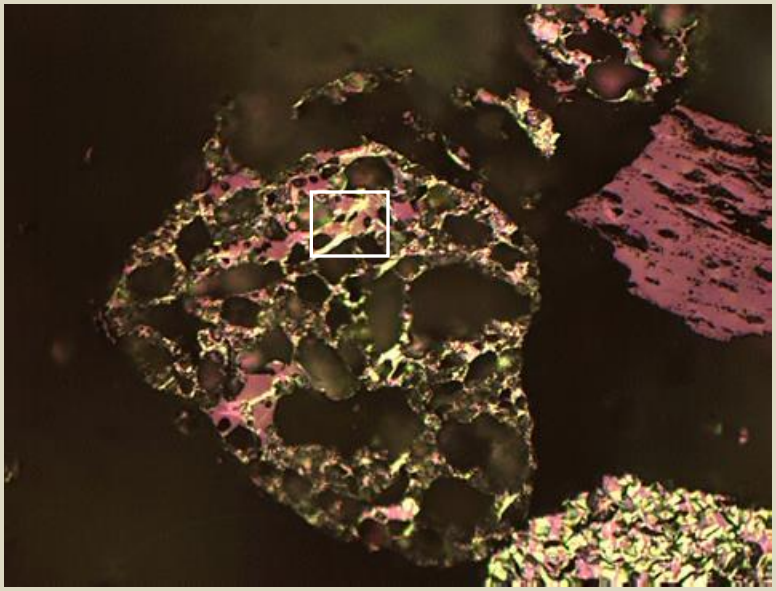
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Crassinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



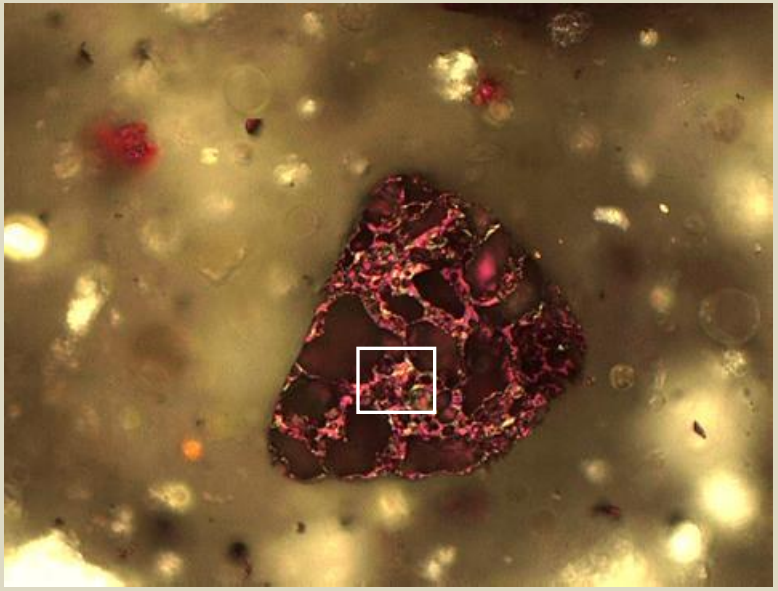


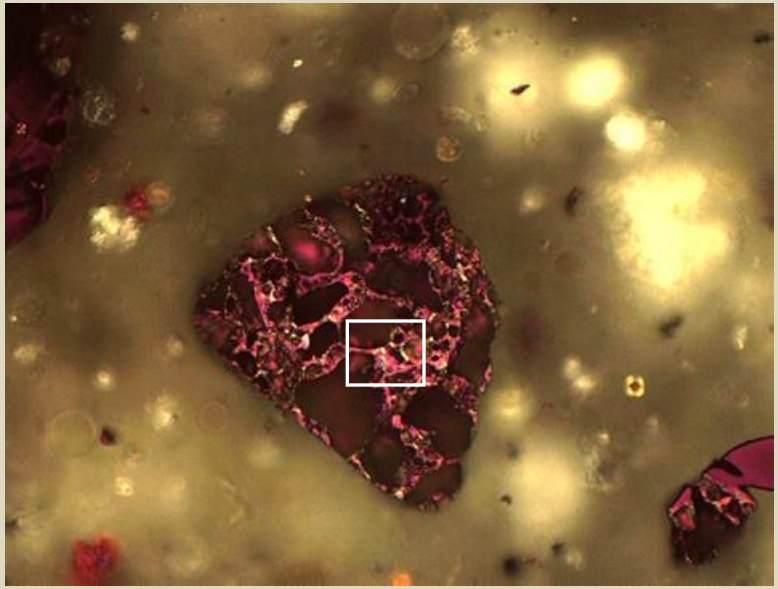
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Tenuinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



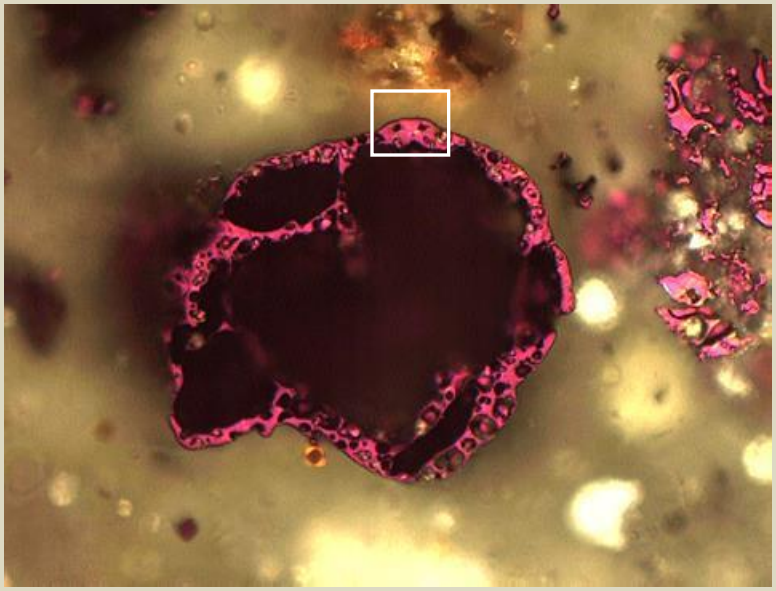


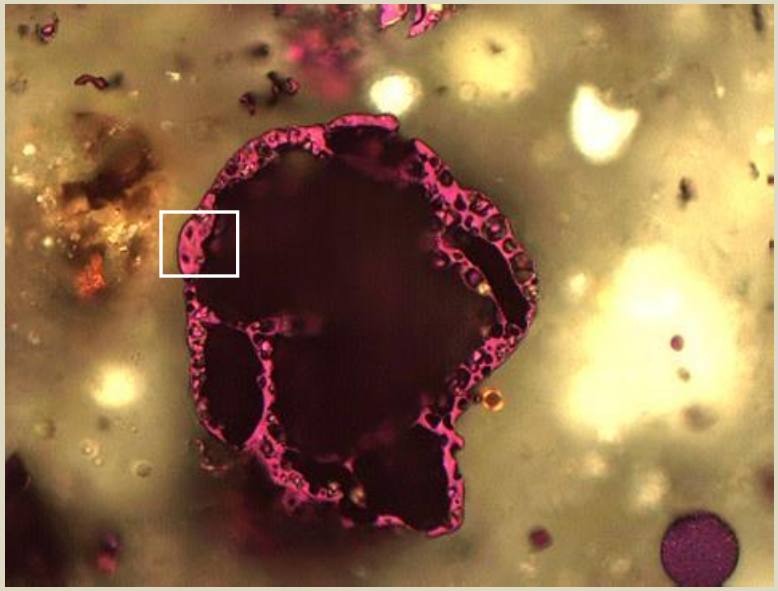
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Crassinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



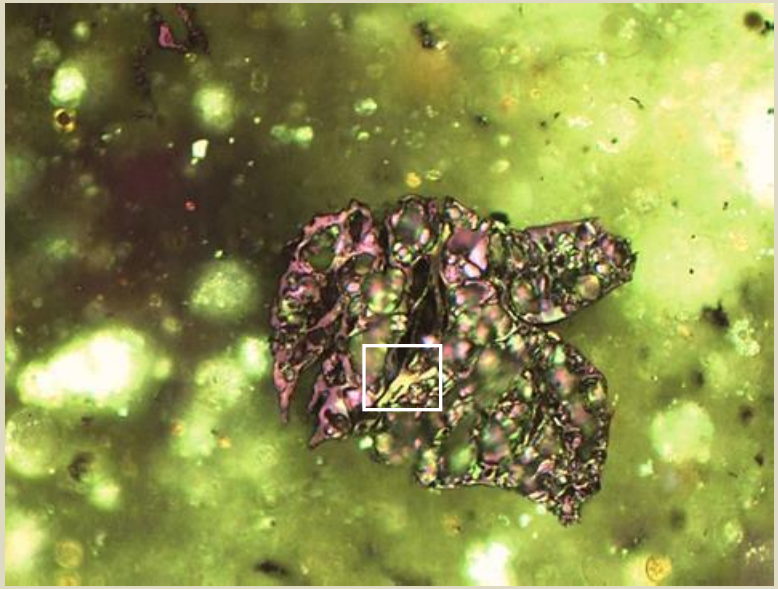


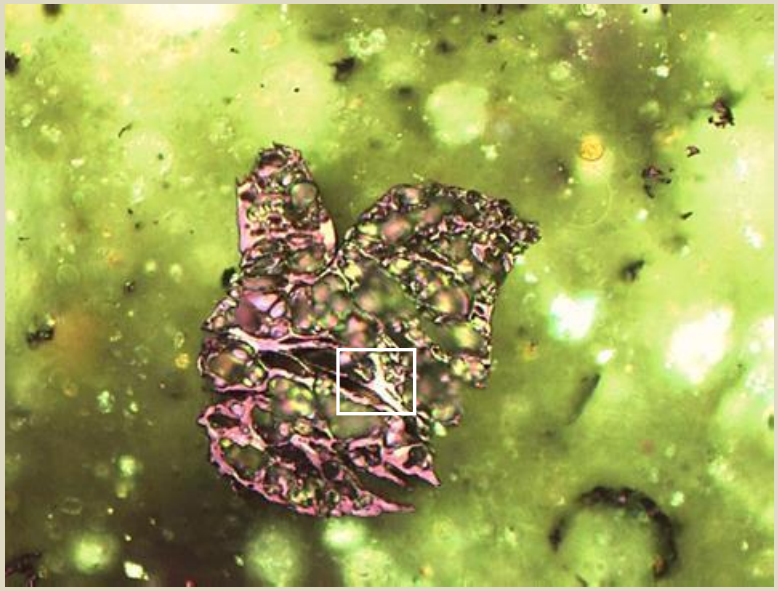
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Tenuisphere**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



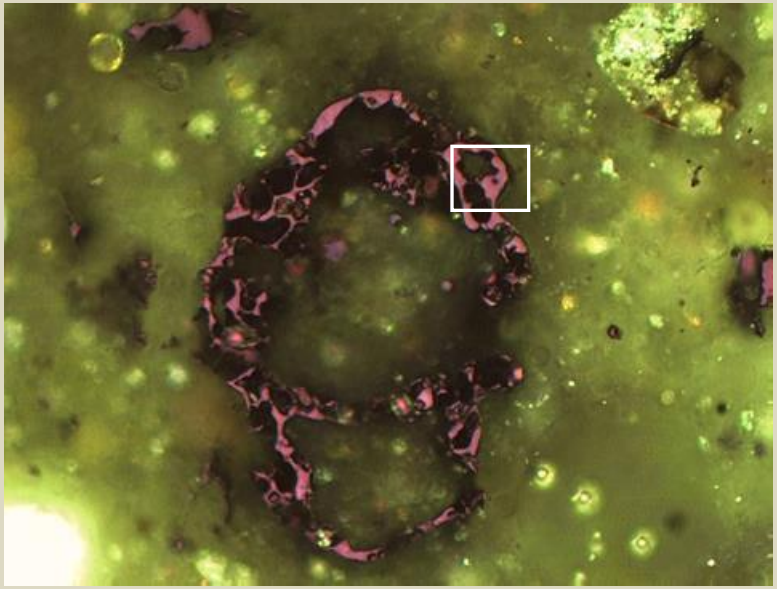


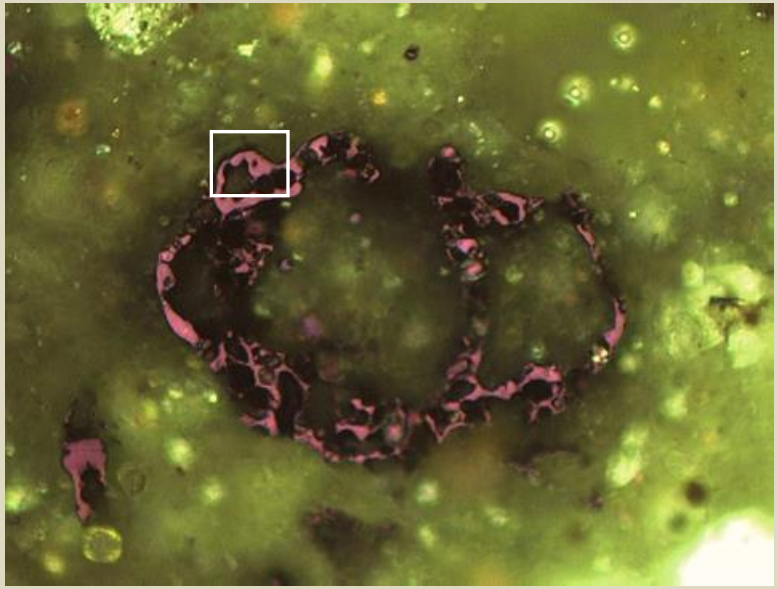
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Tenuinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



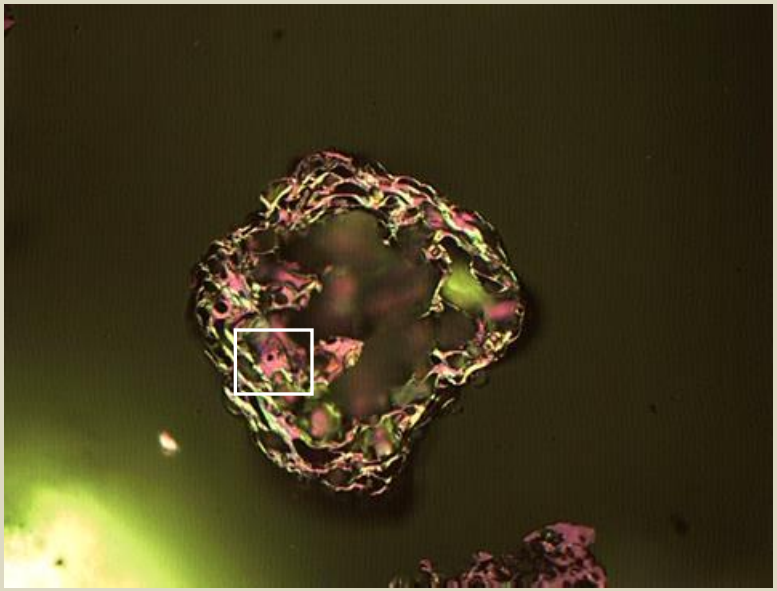


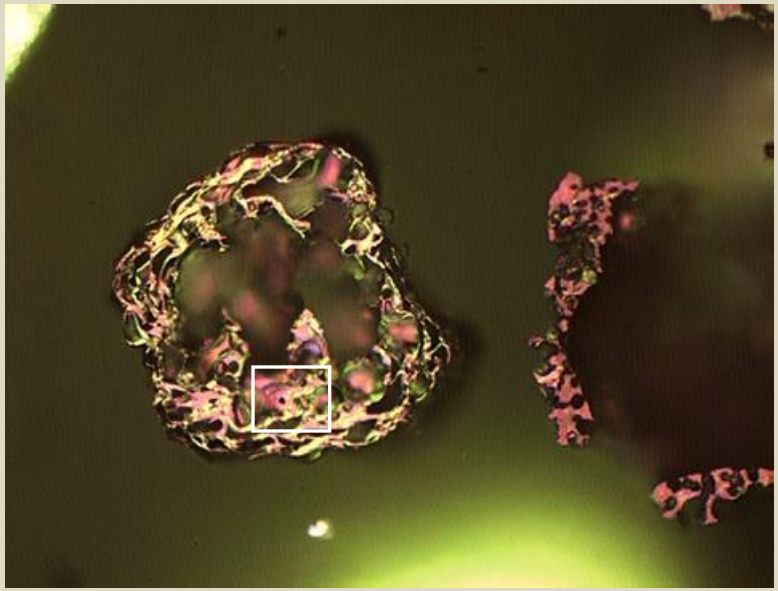
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Crassisphere**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



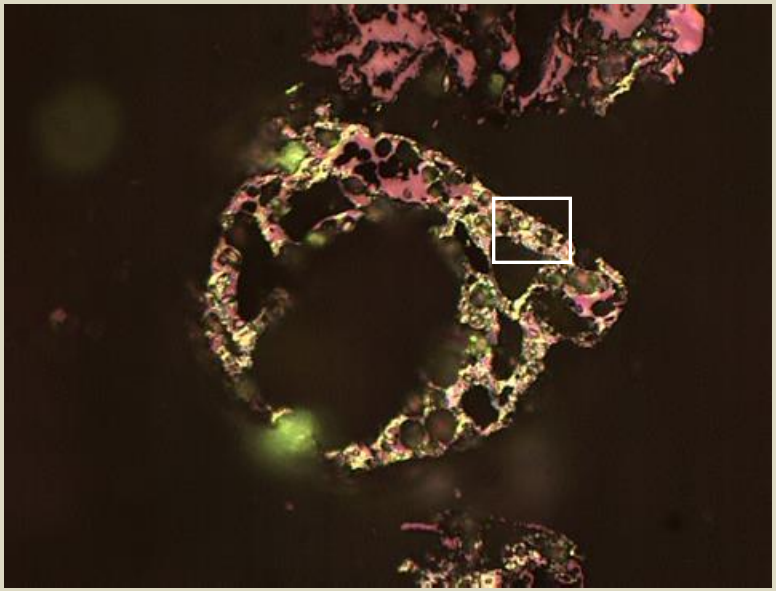


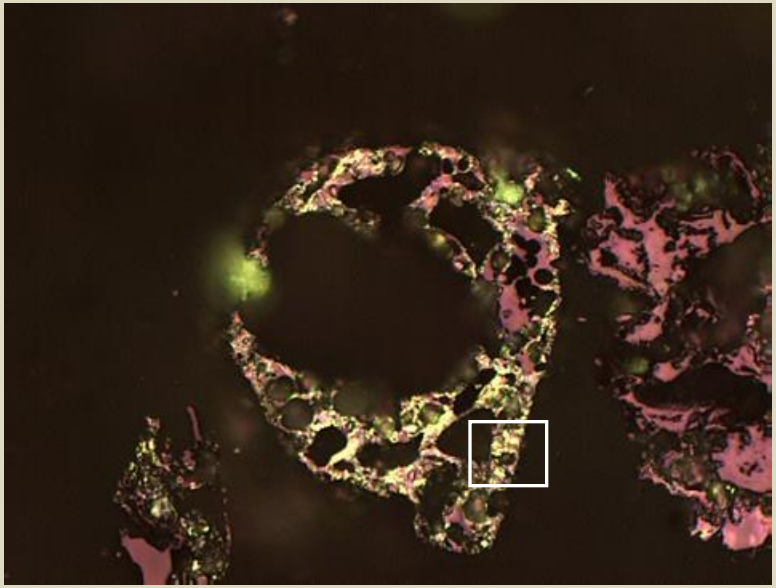
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Crassisphere**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



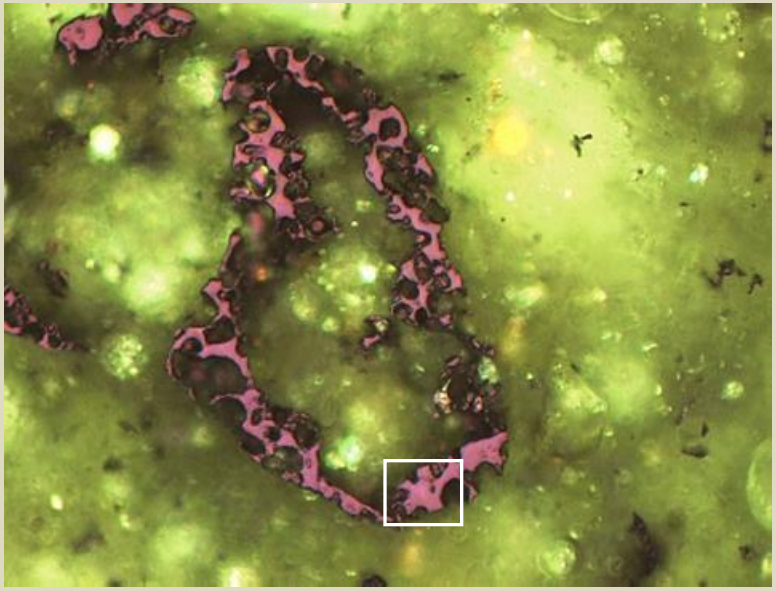


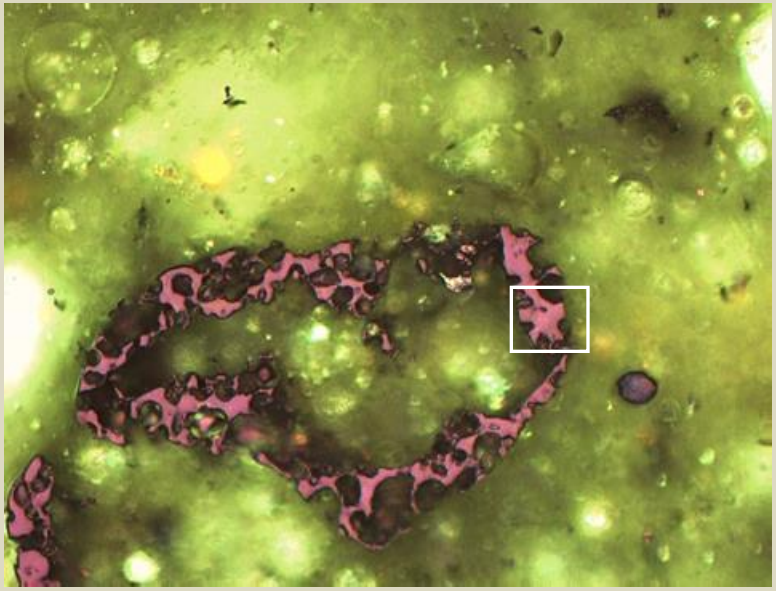
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Crassisphere**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



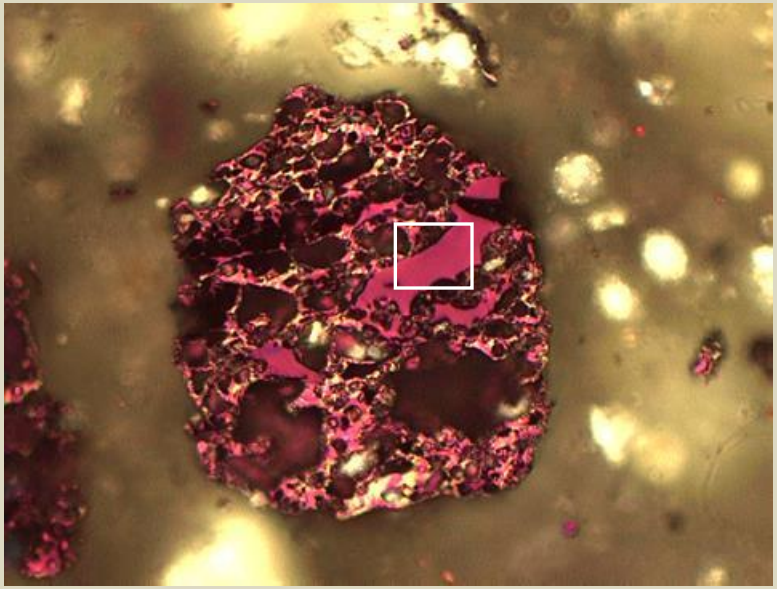


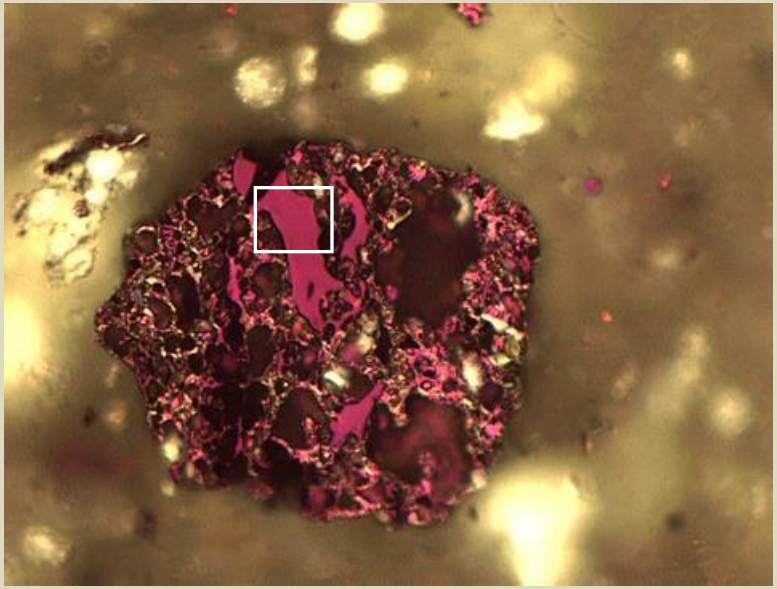
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Crassisphere**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



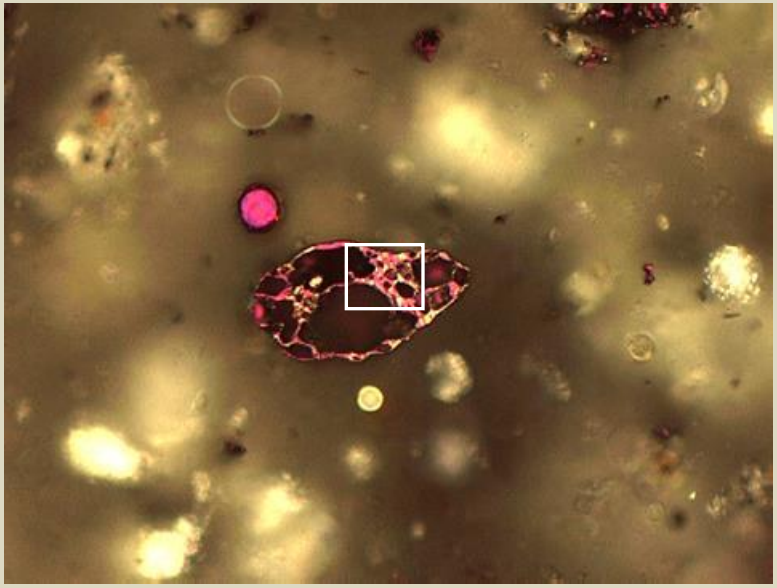


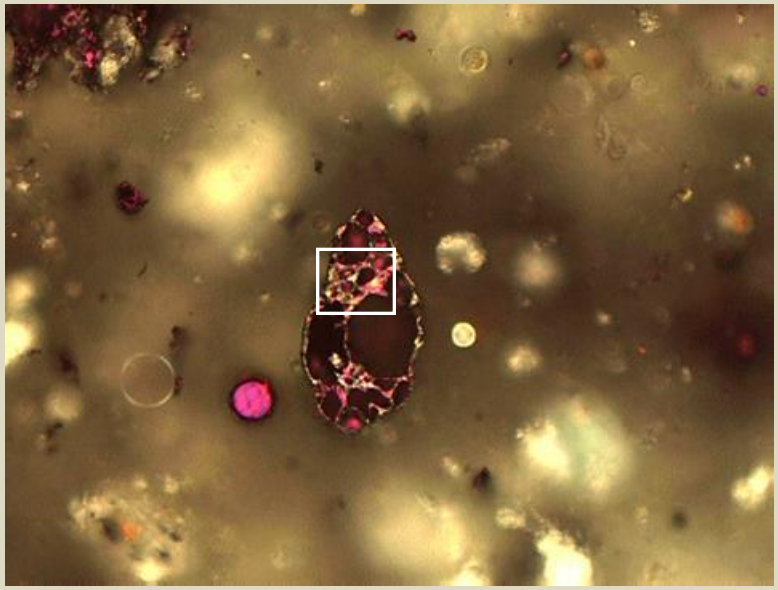
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Mixed porous**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



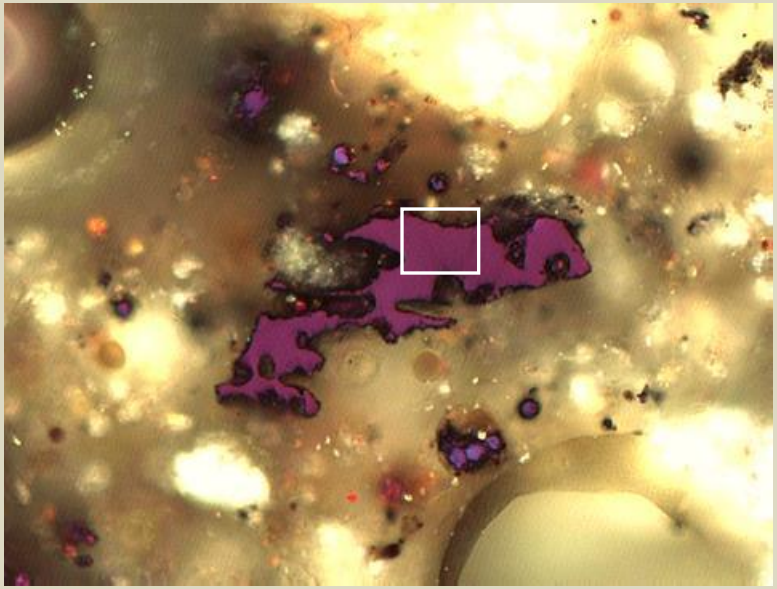


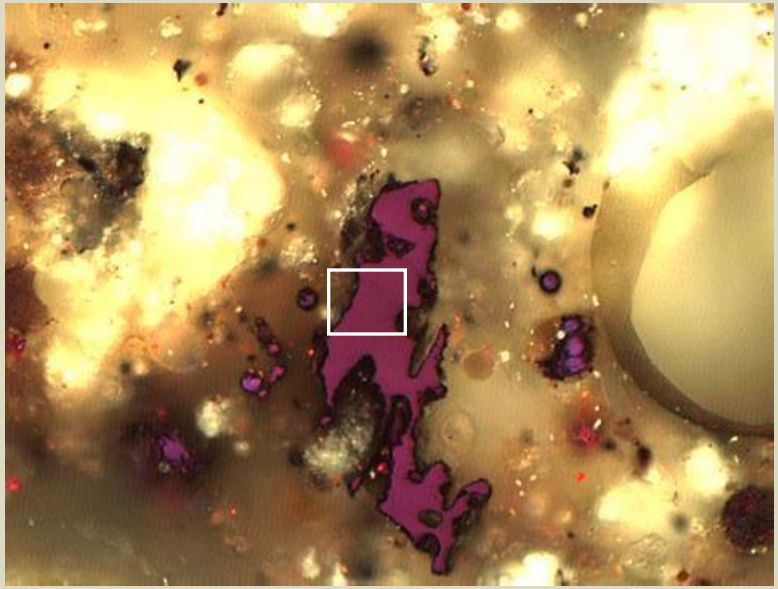
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Tenuinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



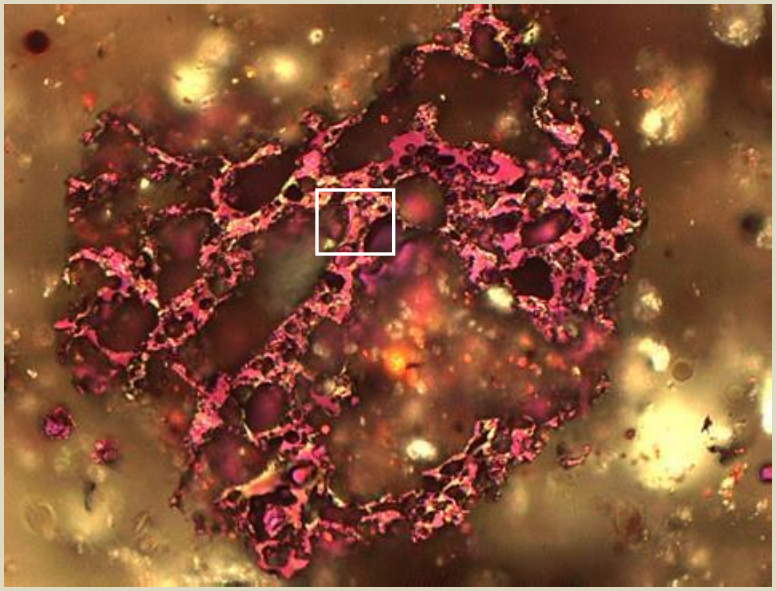


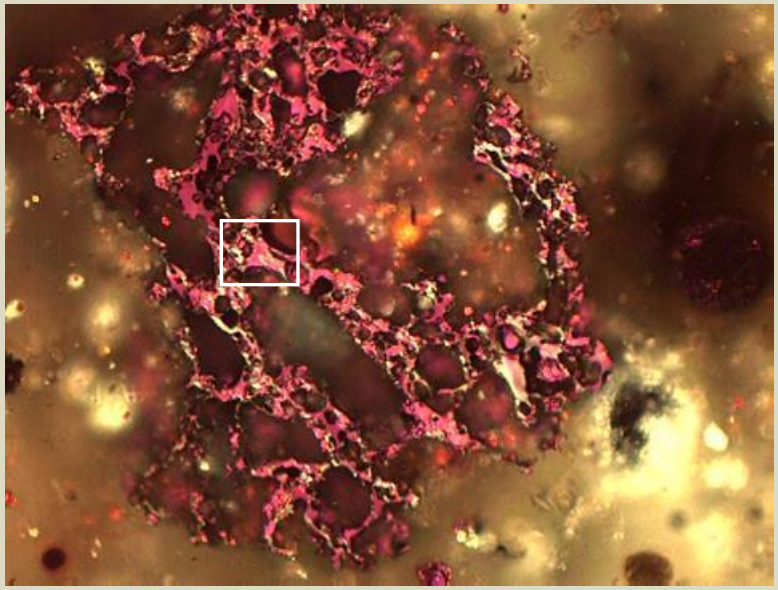
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal (Low rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Solid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



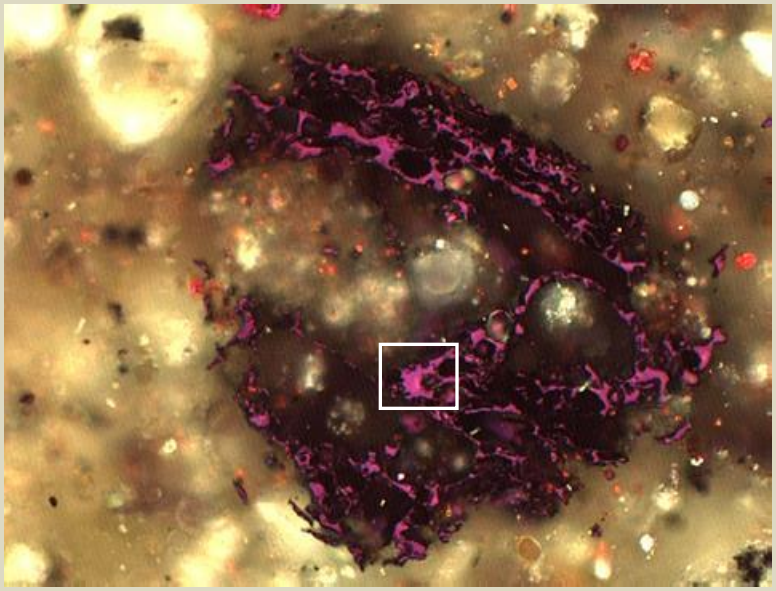


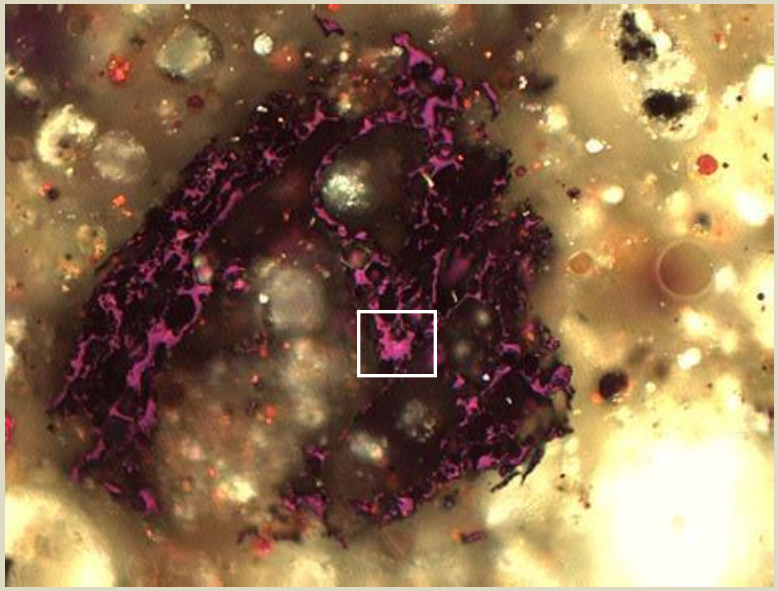
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Low rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Crassinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Unburned Carbon



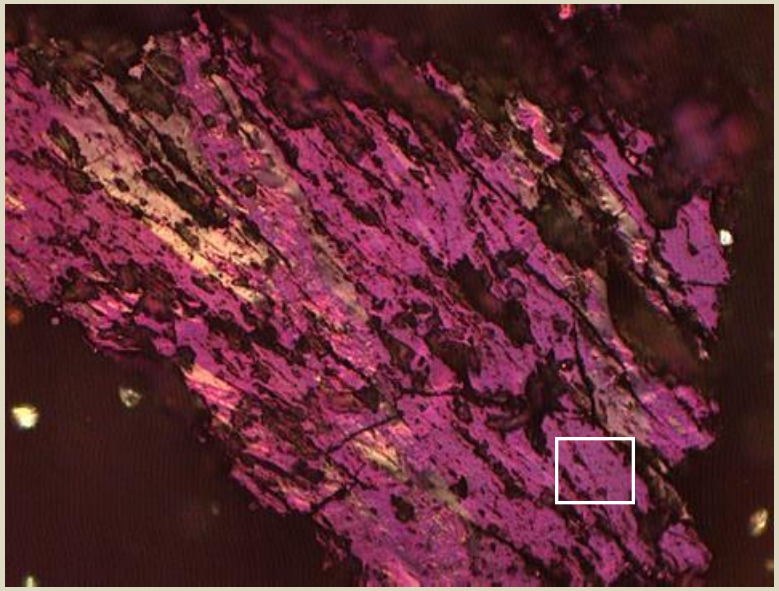


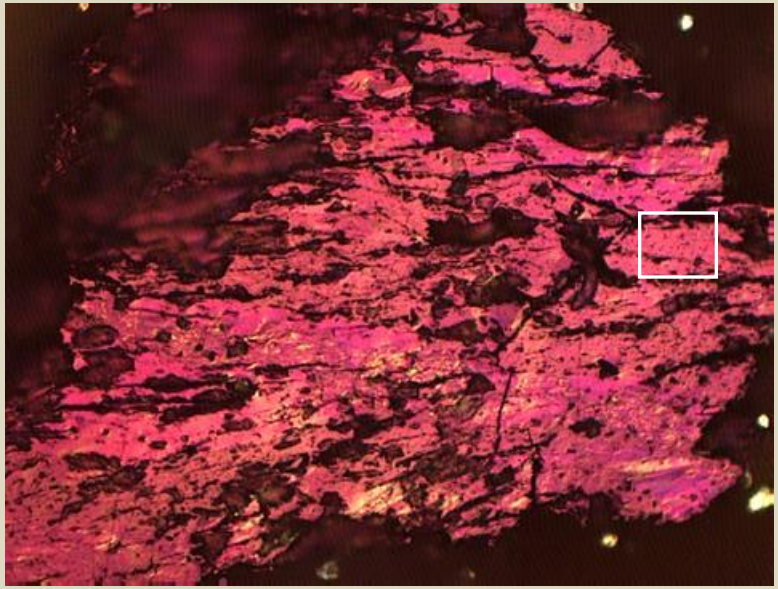
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal (Low rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Crassinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash from: COAL BLEND + PET COKE

Unburned Carbon



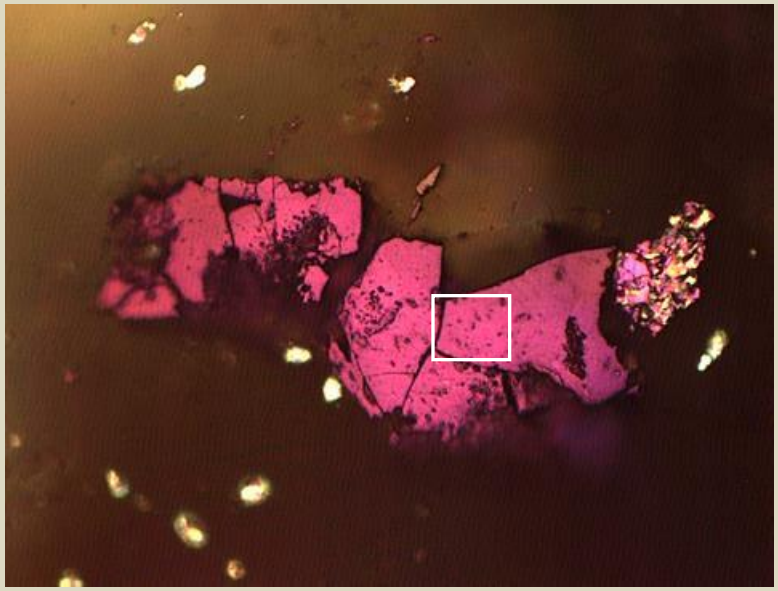


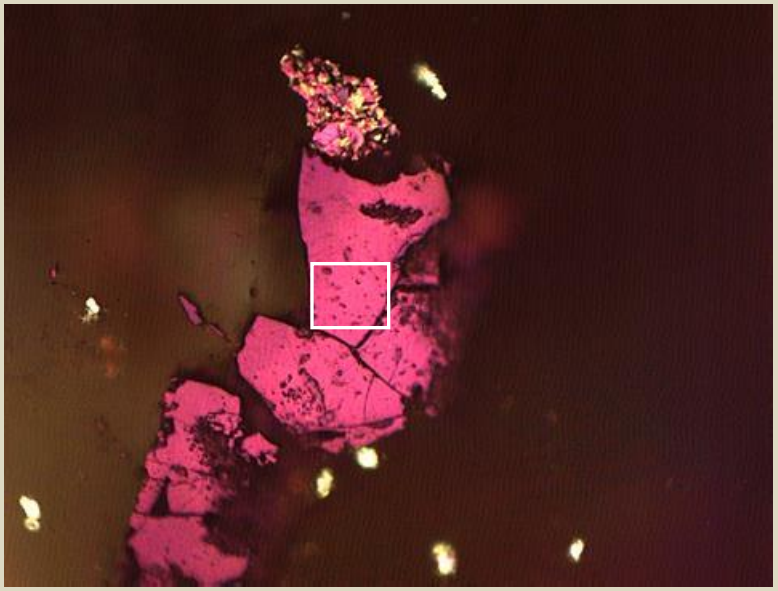
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (anthracite)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Inertoid (from vitrinite)**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash from: COAL BLEND + PET COKE

Unburned Carbon



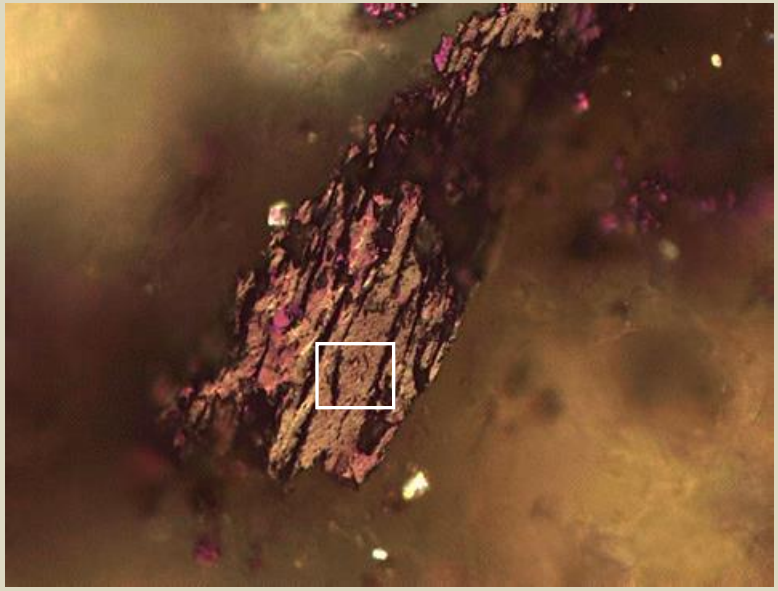


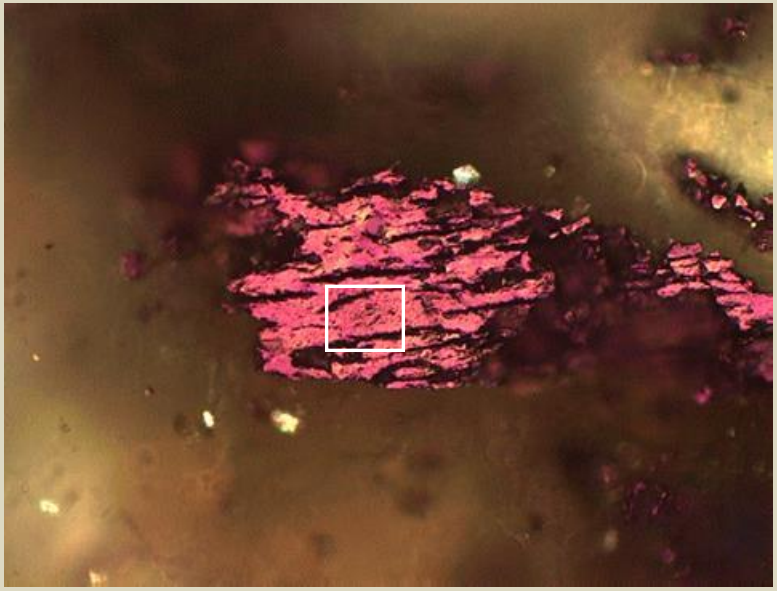
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal (anthracite)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Solid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash from: COAL BLEND + PET COKE

Unburned Carbon



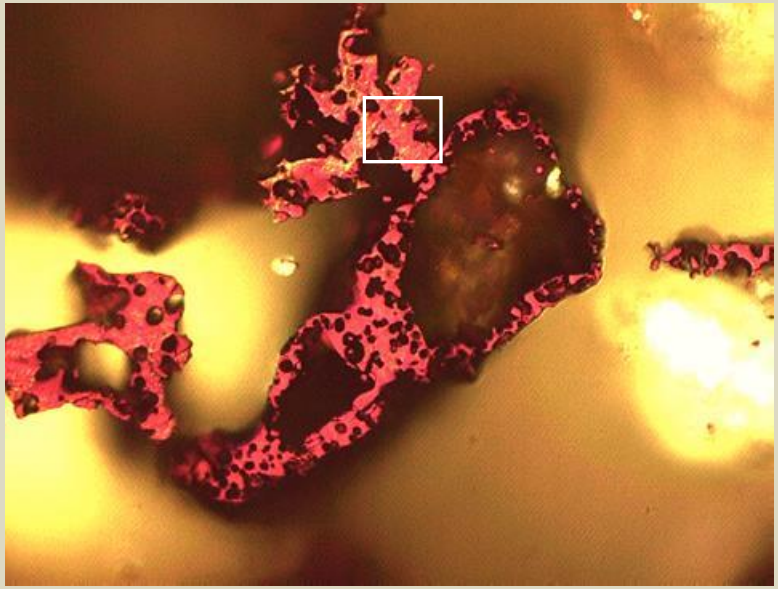


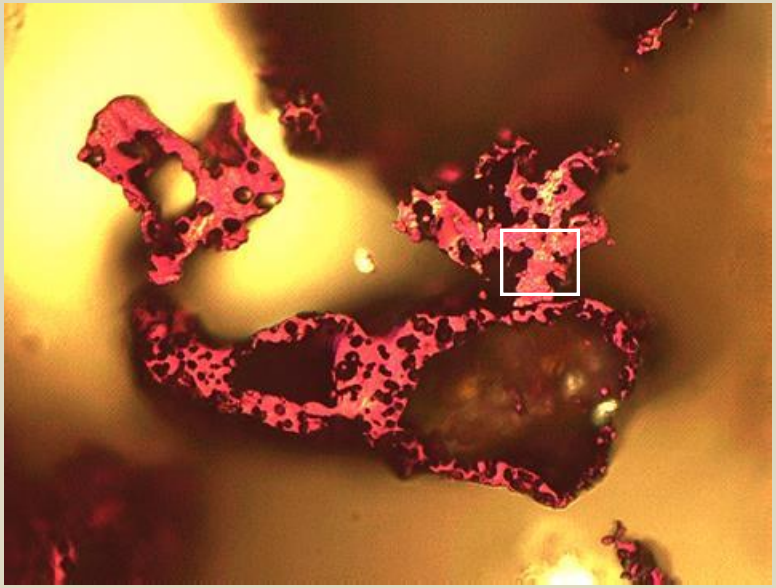
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (anthracite)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Inertoid (from vitrinite)**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash
COAL BLEND + BIOMASS (sewage sludge + olive pulp)

Unburned Carbon



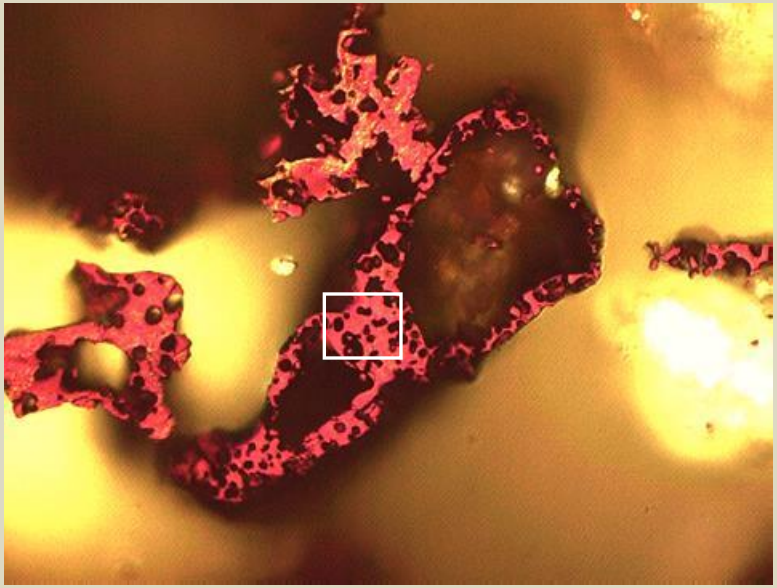


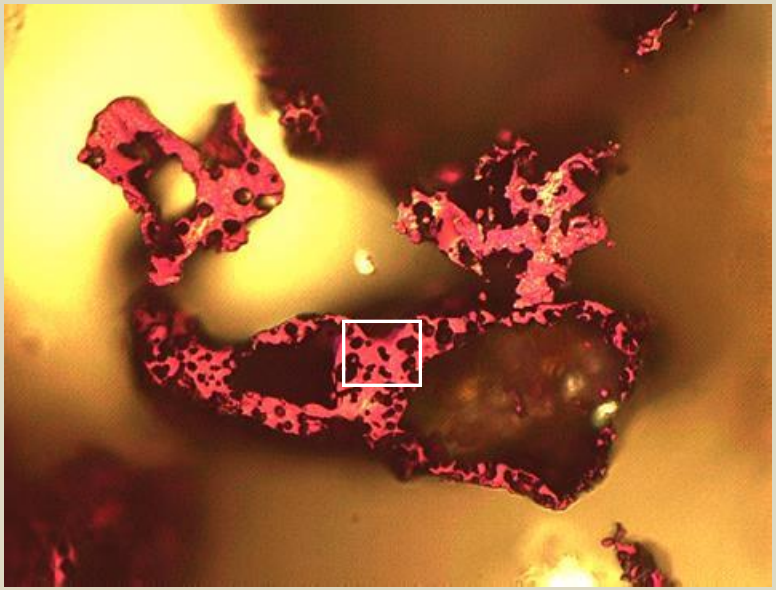
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Crassinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash
COAL BLEND + BIOMASS (sewage sludge + olive pulp)

Unburned Carbon



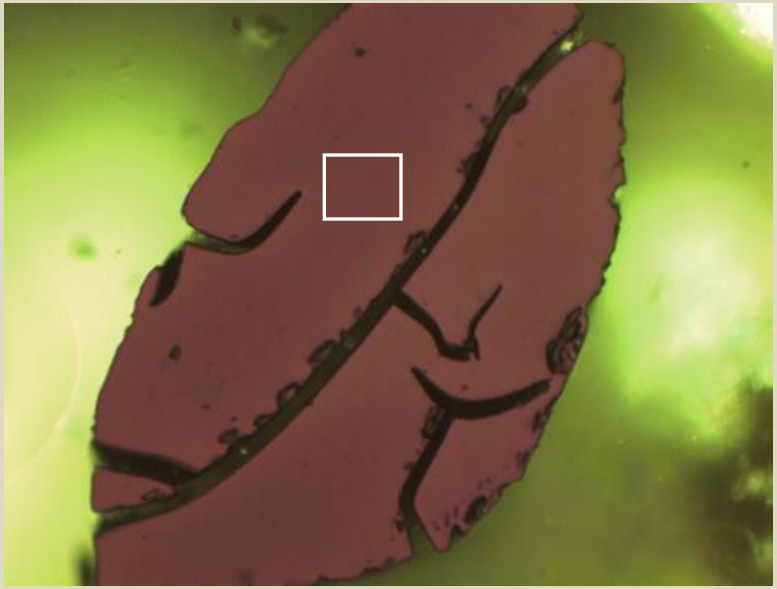


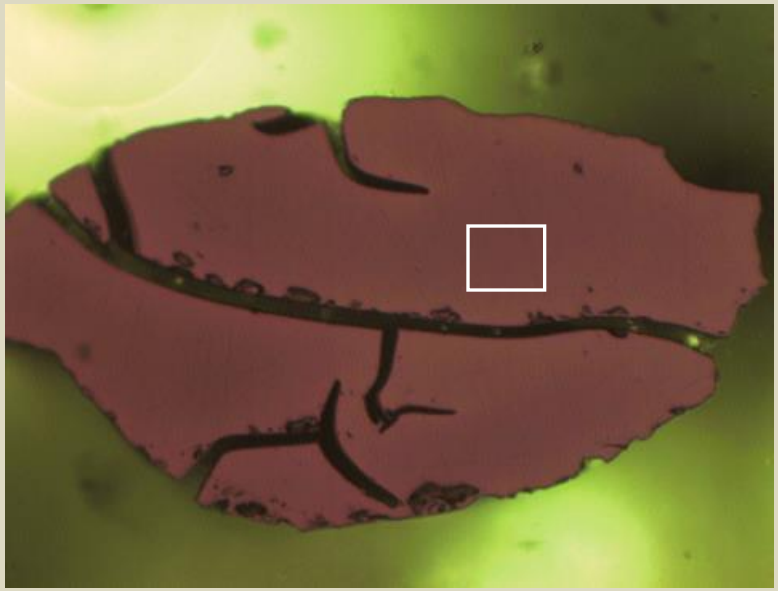
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Crassinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash
COAL BLEND + BIOMASS (wood pellets + palm pit scales)

Unburned Carbon



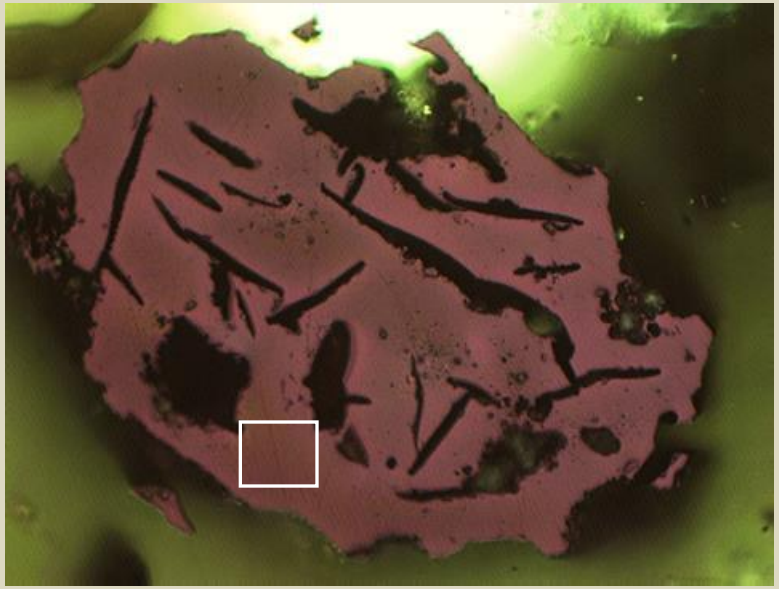


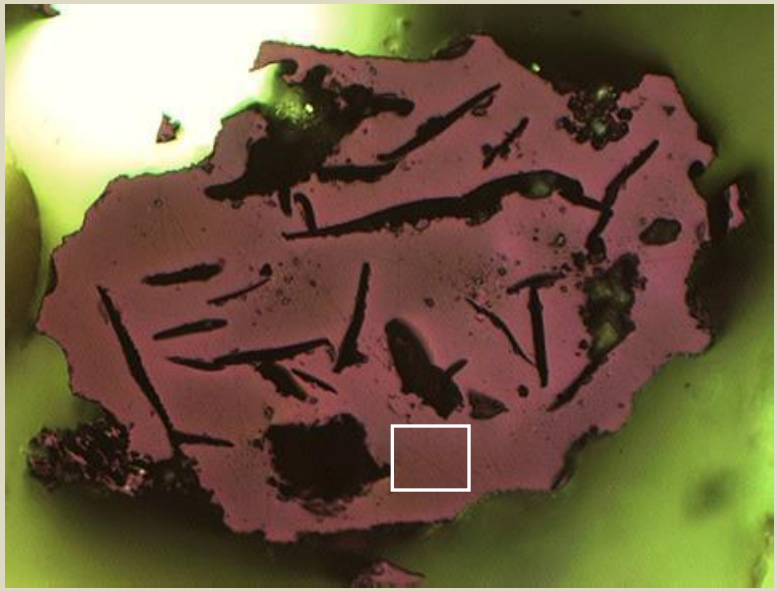
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Solid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash
COAL BLEND + BIOMASS (wood pellets + palm pit scales)

Unburned Carbon



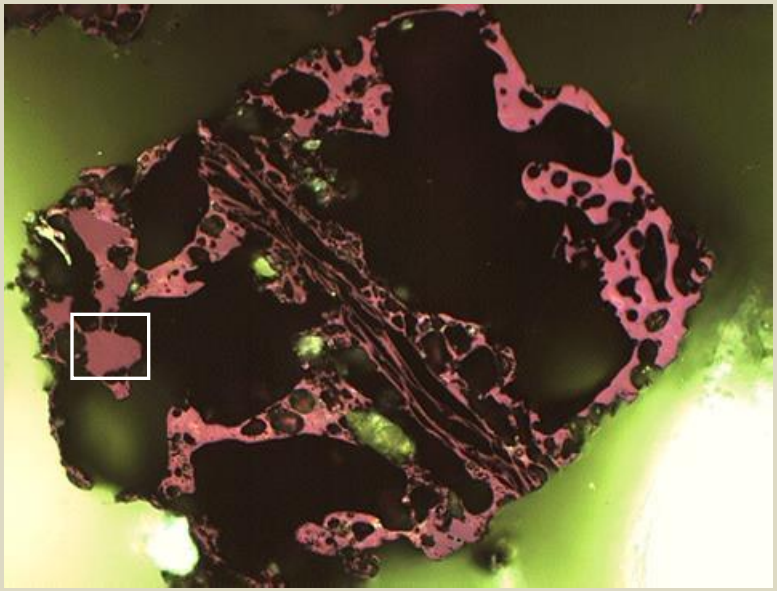


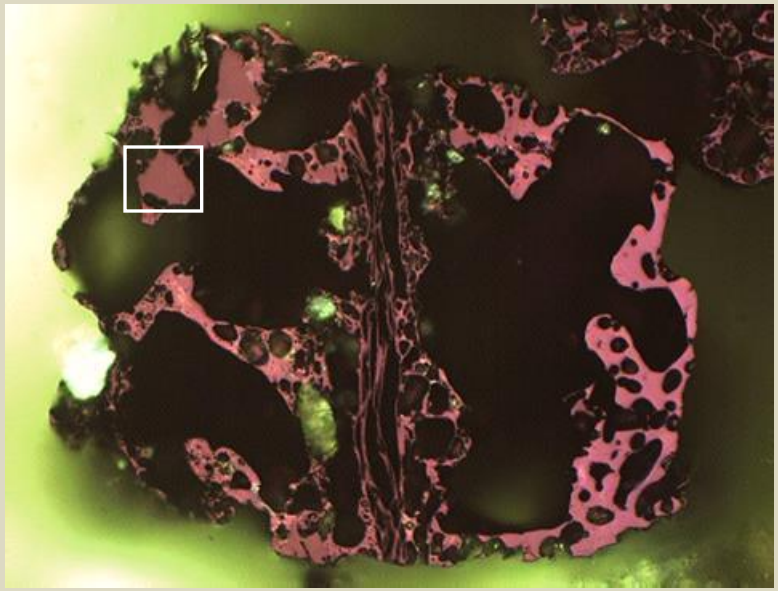
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Inertoid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash
COAL BLEND + BIOMASS (wood pellets + palm pit scales)

Unburned Carbon



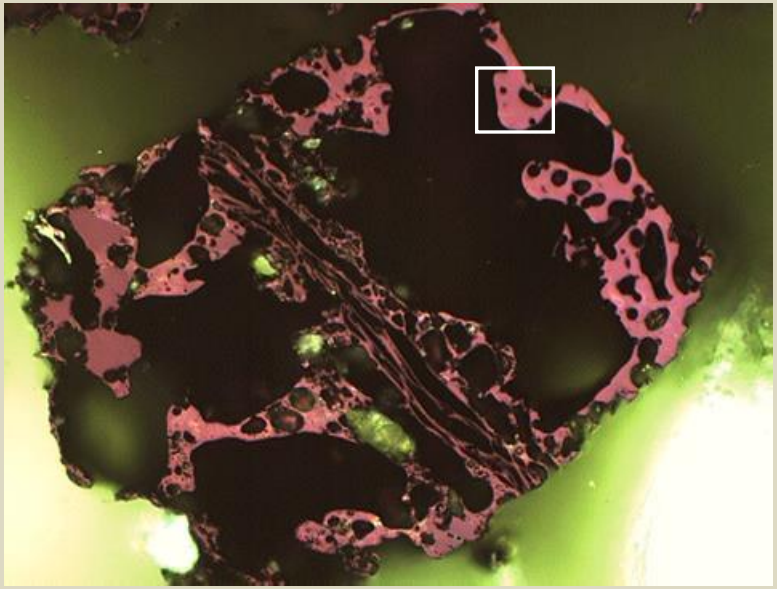


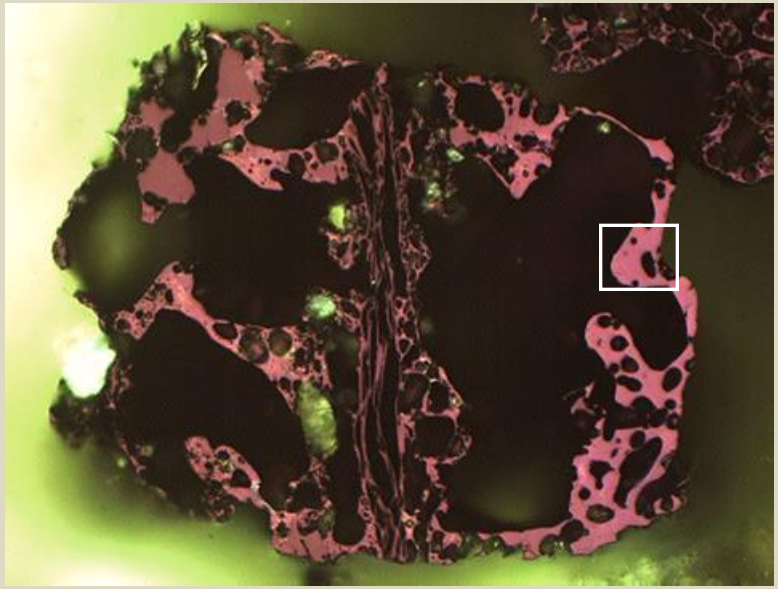
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Mixed porous**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash
COAL BLEND + BIOMASS (wood pellets + palm pit scales)

Unburned Carbon



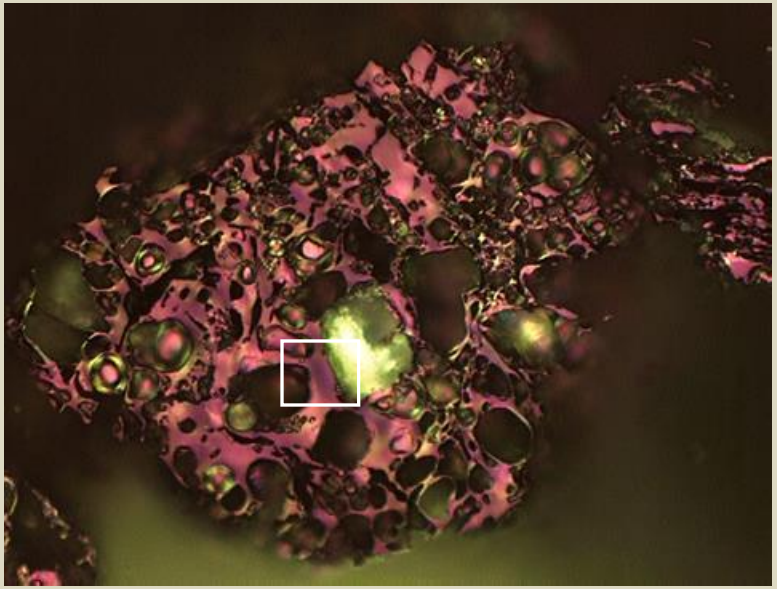


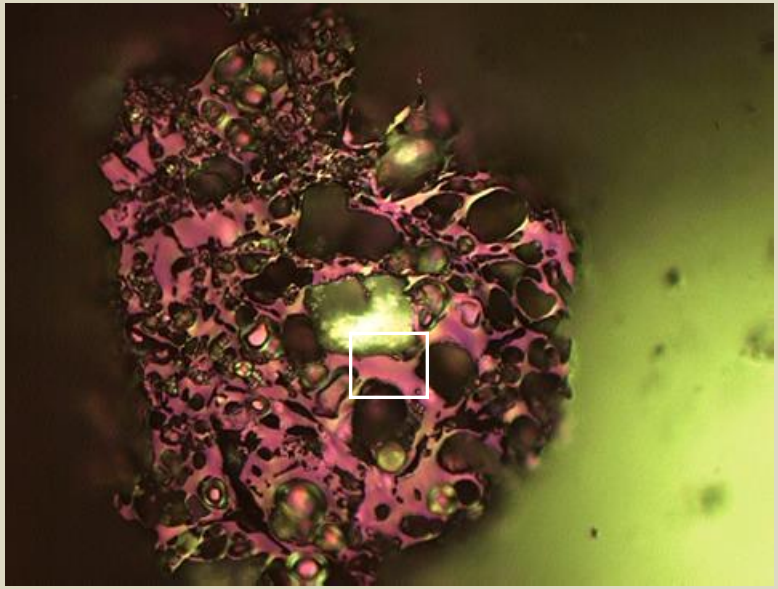
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Mixed porous**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash
COAL BLEND + BIOMASS (sewage sludge + olive stone/olive pulp)

Unburned Carbon



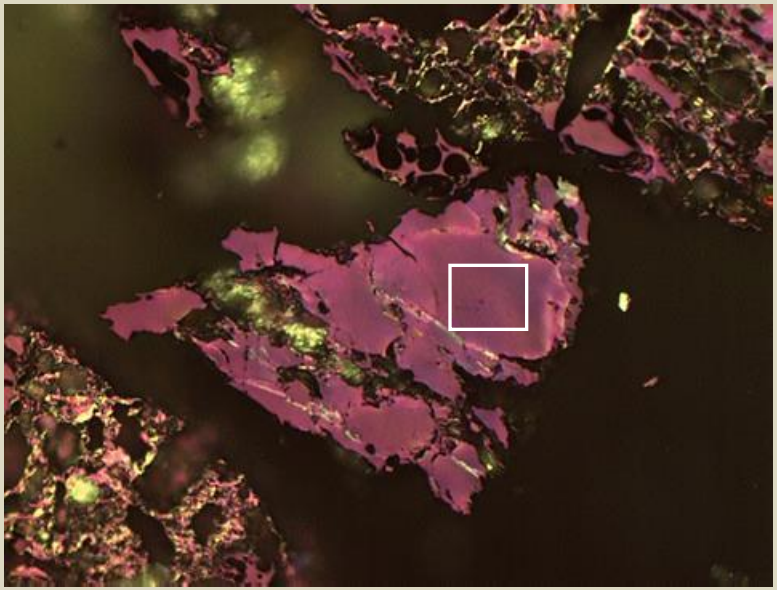


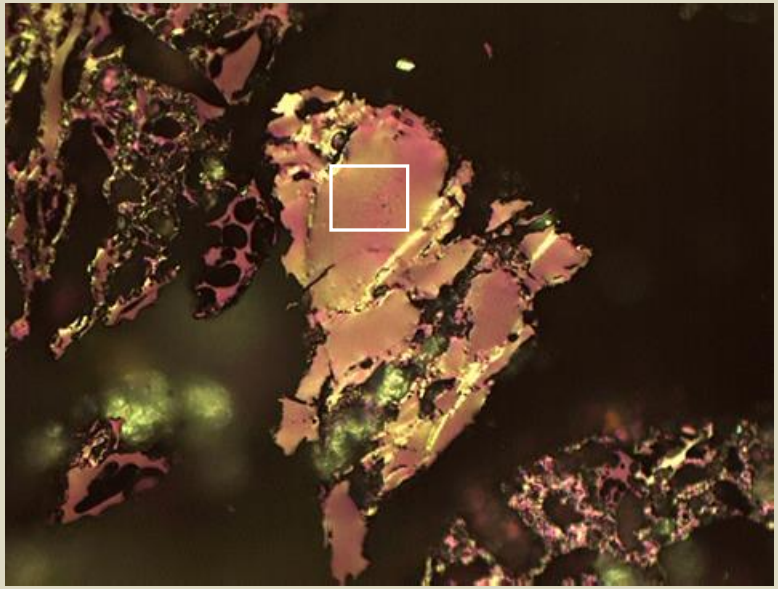
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Crassinetwork**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash
COAL BLEND + BIOMASS (sewage sludge + olive stone/olive pulpes)

Unburned Carbon



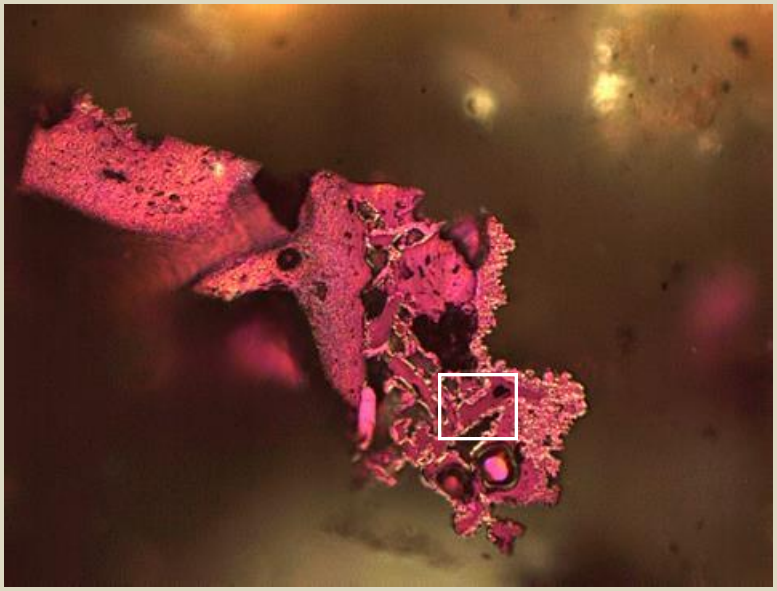


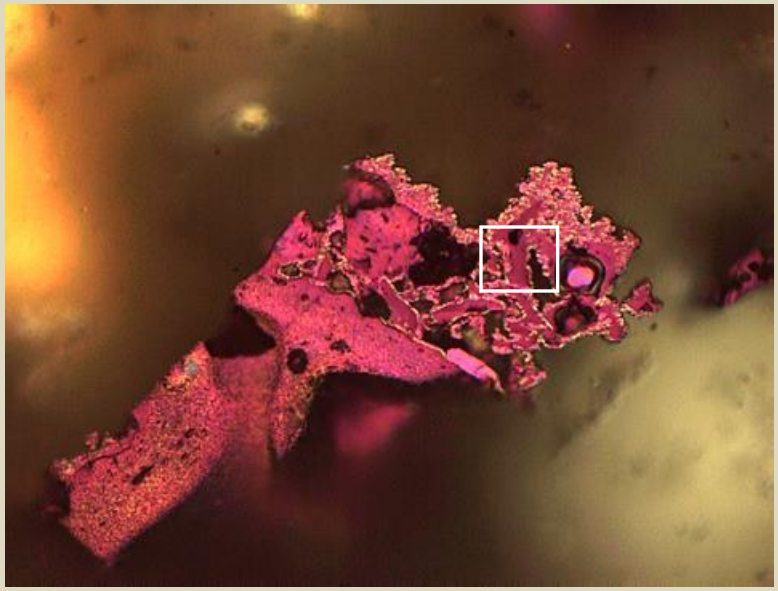
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Inertoid**

Long side of the pictures: 200 microns

Stoker boiler Fly Ash

Unburned Carbon



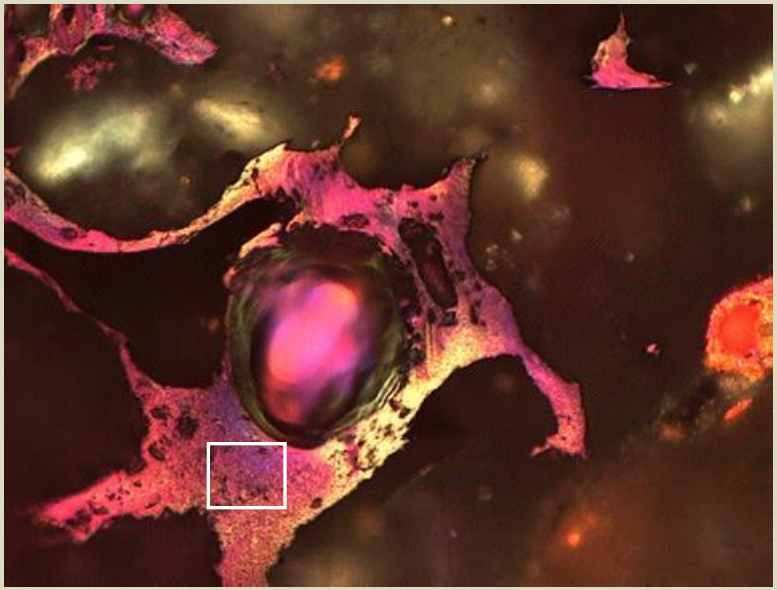


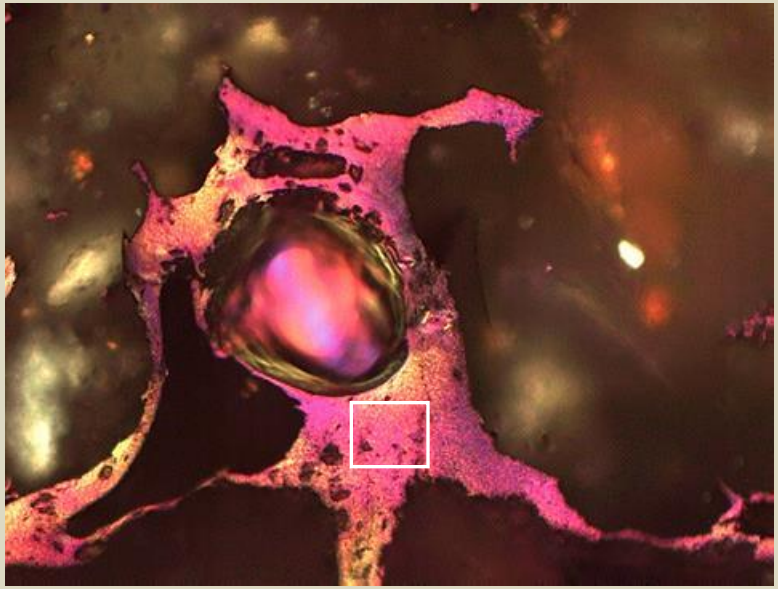
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**-**

Long side of the pictures: 200 microns

Stoker boiler Fly Ash

Unburned Carbon



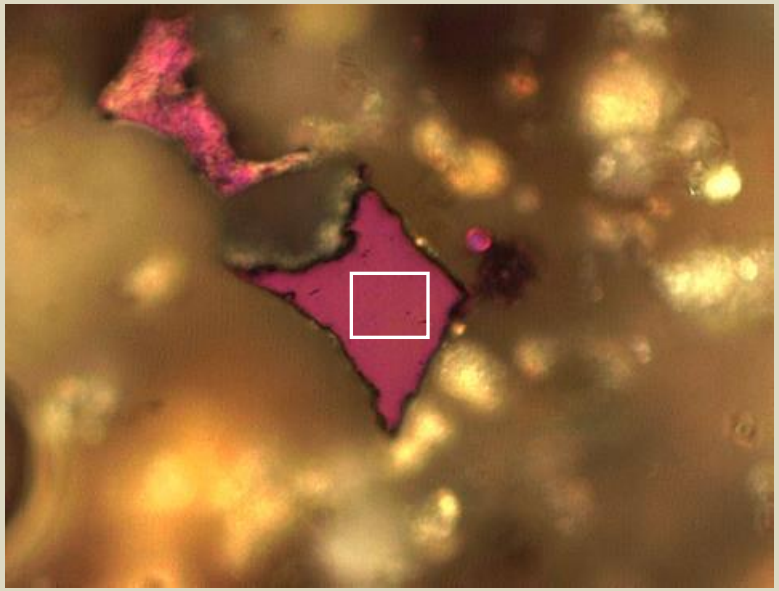


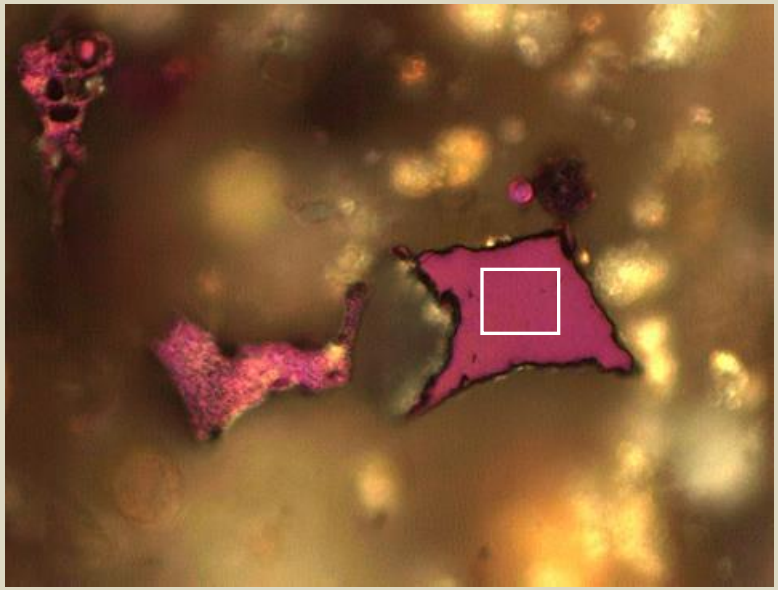
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**-**

Long side of the pictures: 200 microns

Stoker boiler Fly Ash

Unburned Carbon



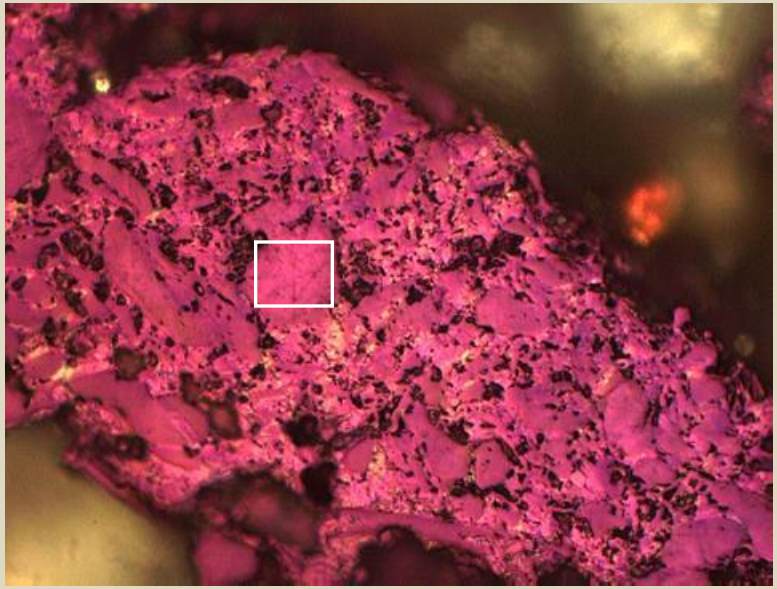


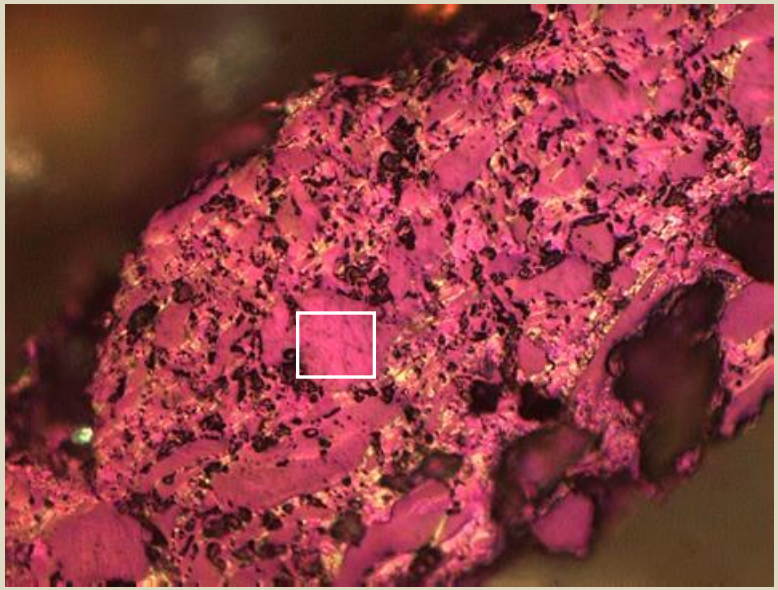
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**-**

Long side of the pictures: 200 microns

Stoker boiler Fly Ash

Unburned Carbon



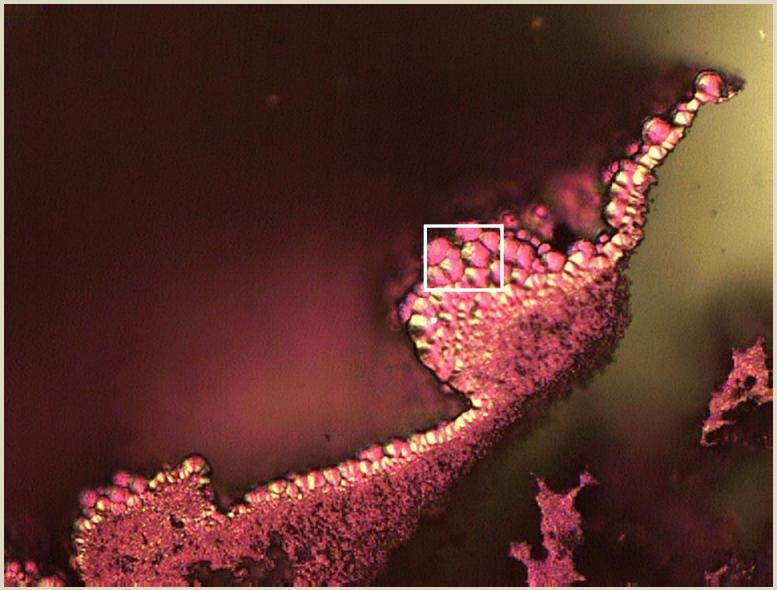


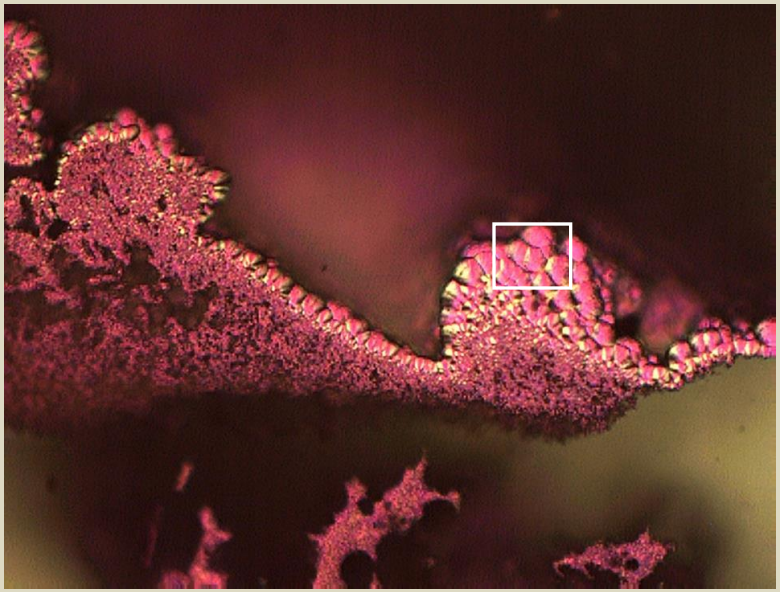
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**-**

Long side of the pictures: 200 microns

Stoker boiler Fly Ash

Unburned Carbon – Pyrolytic carbon



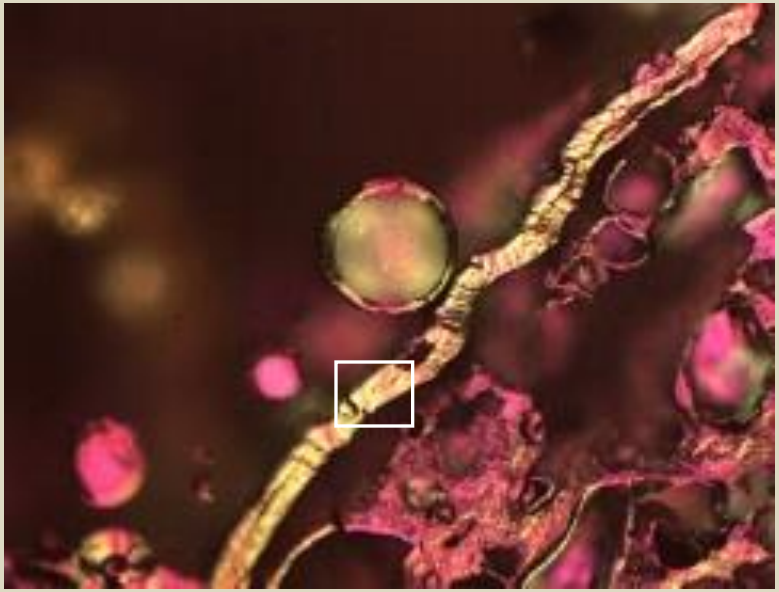


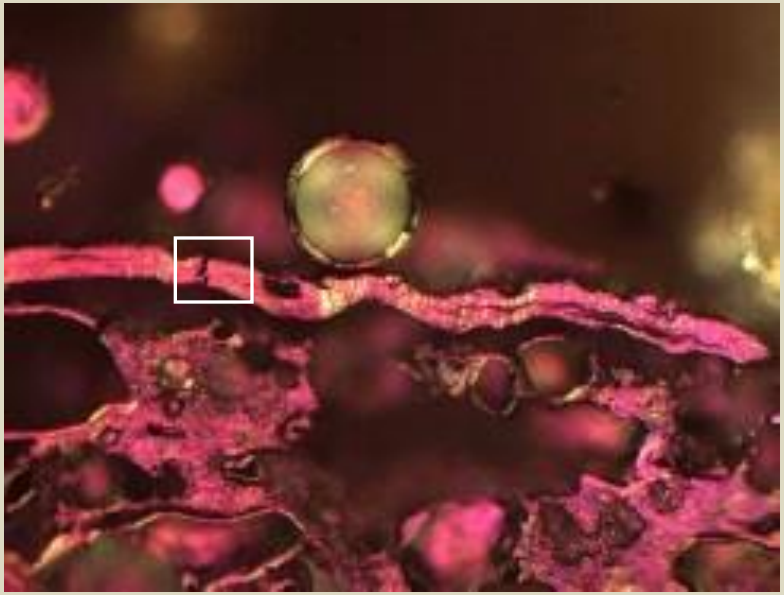
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**-**

Long side of the pictures: 200 microns

Stoker boiler Fly Ash

Unburned Carbon – Pyrolytic carbon



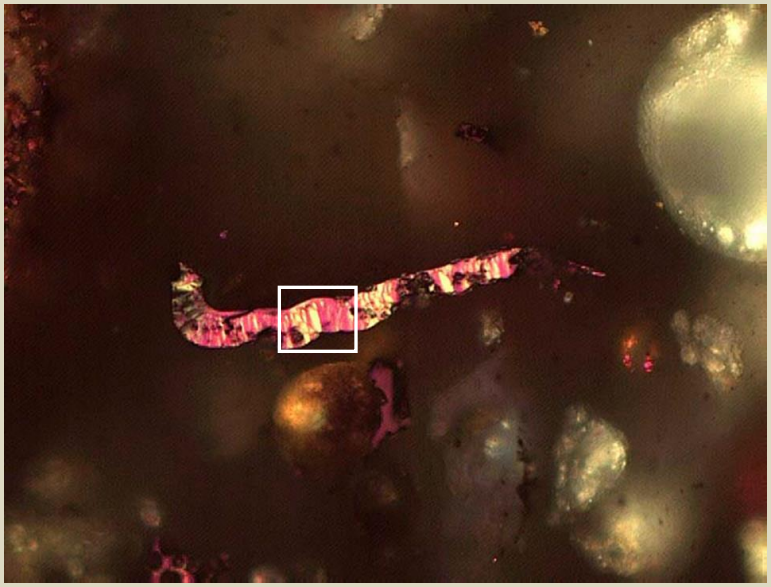


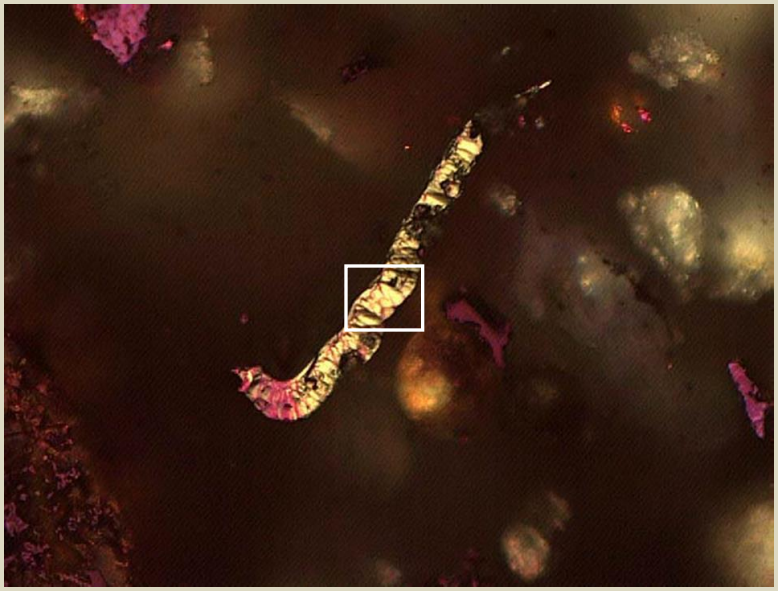
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**-**

Long side of the pictures: 200 microns

Stoker boiler Fly Ash

Unburned Carbon – Pyrolytic carbon



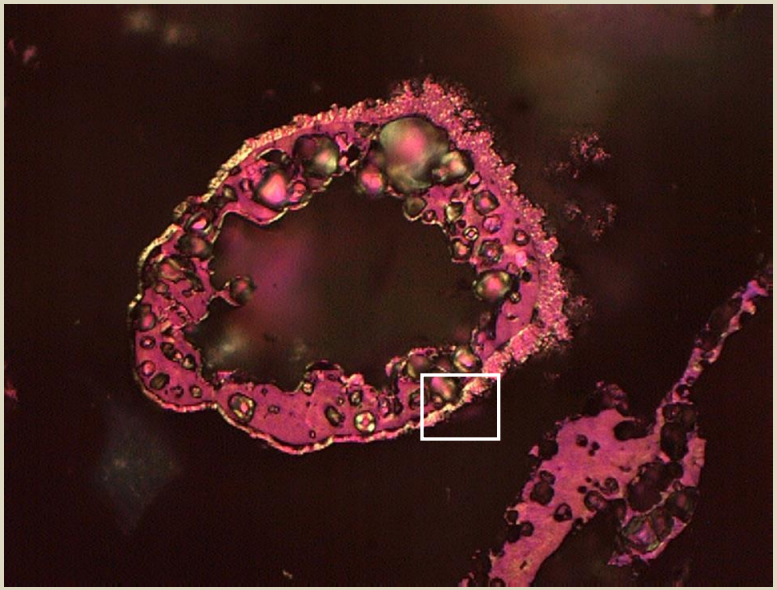


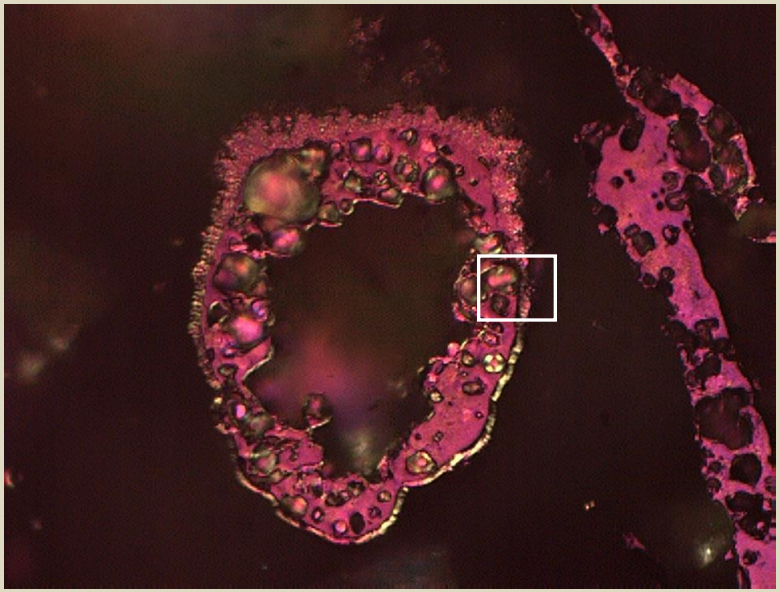
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**-**

Long side of the pictures: 200 microns

Stoker boiler Fly Ash

Unburned Carbon – Pyrolytic carbon



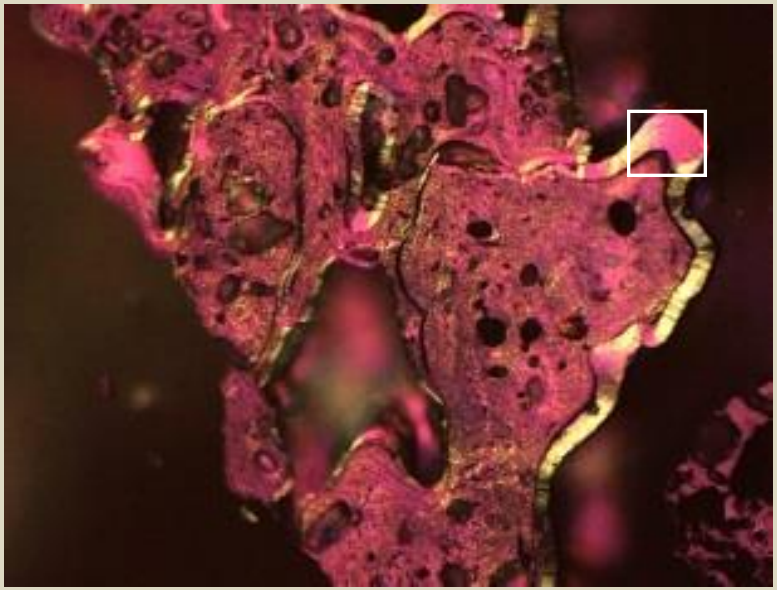


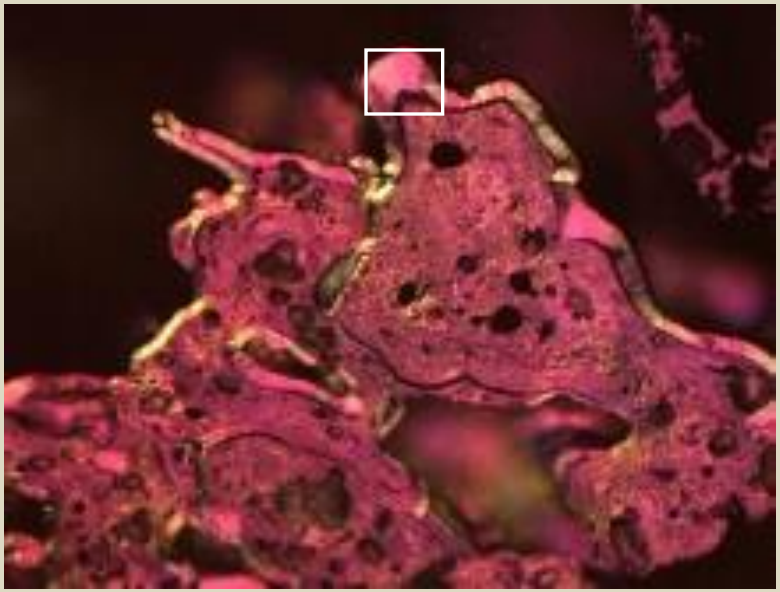
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Crassisphere**

Long side of the pictures: 200 microns

Stoker boiler Fly Ash

Unburned Carbon – Pyrolytic carbon



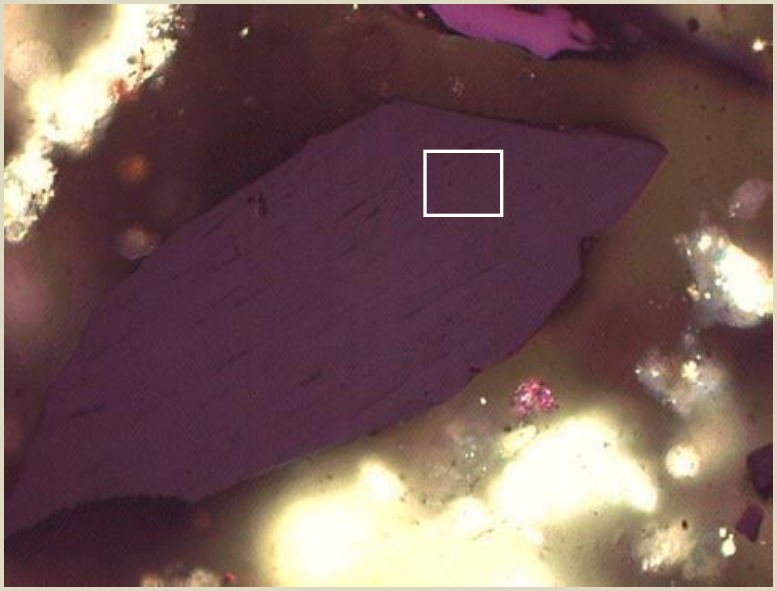


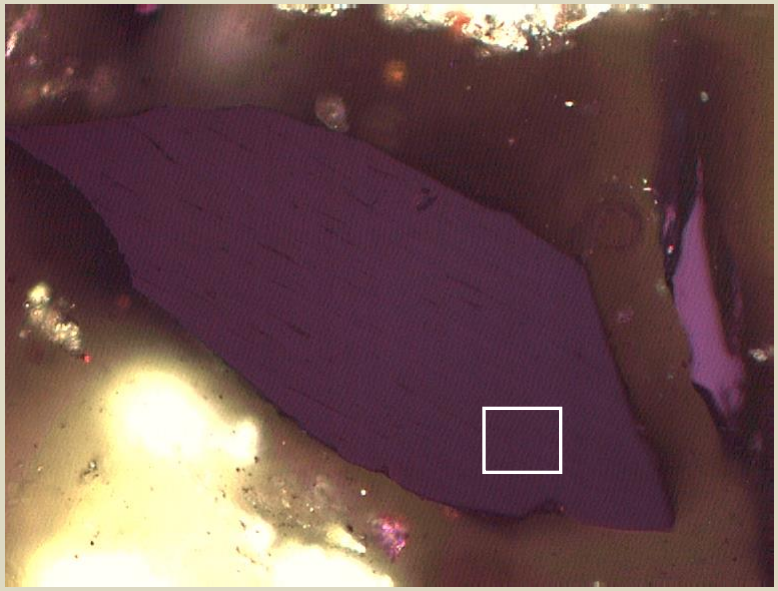
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**-**

Long side of the pictures: 200 microns

Stoker boiler Fly Ash

Unburned Carbon



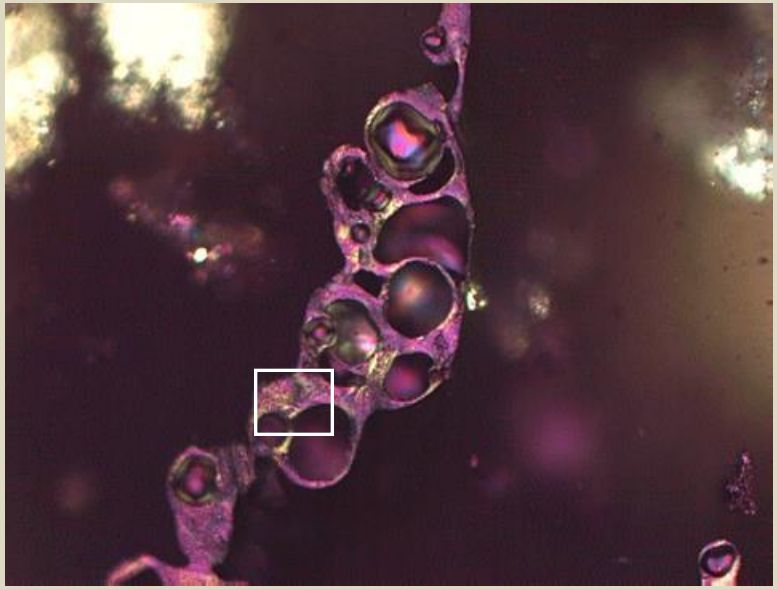


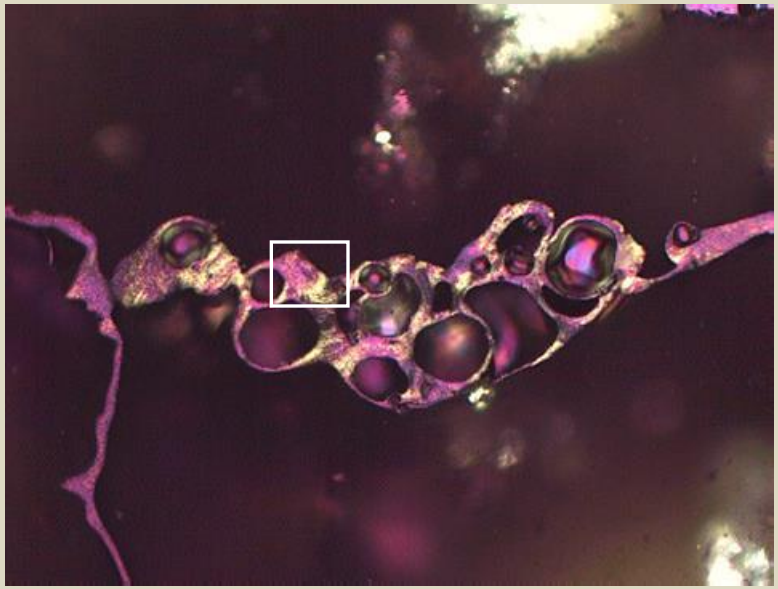
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Solid**

Long side of the pictures: 200 microns

Stoker boiler Fly Ash

Unburned Carbon



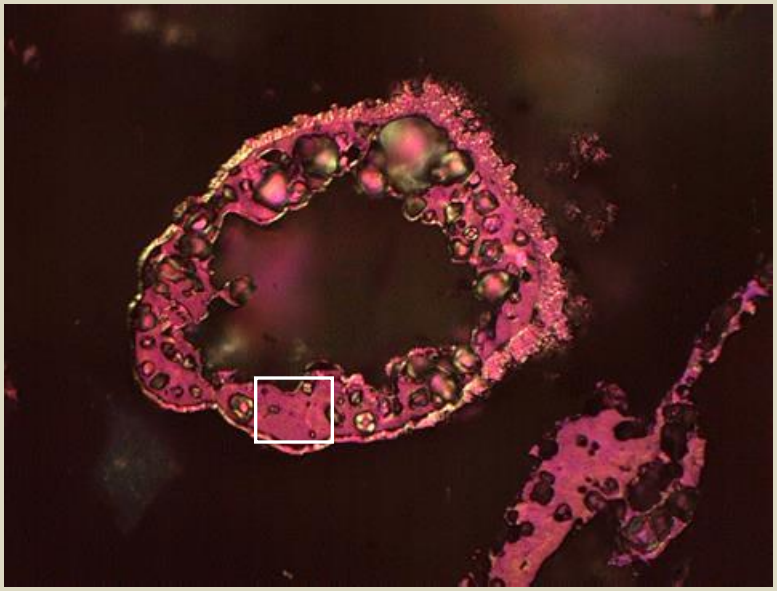


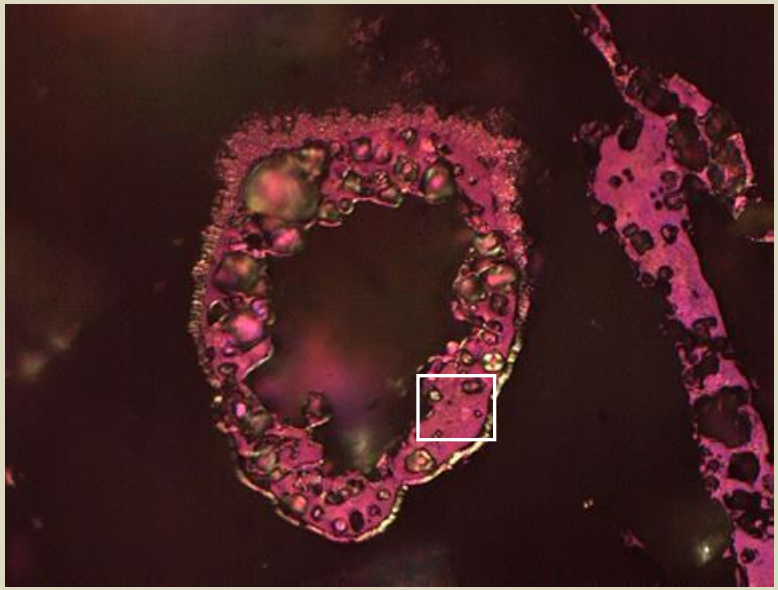
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**-**

Long side of the pictures: 200 microns

Stoker boiler Fly Ash

Unburned Carbon



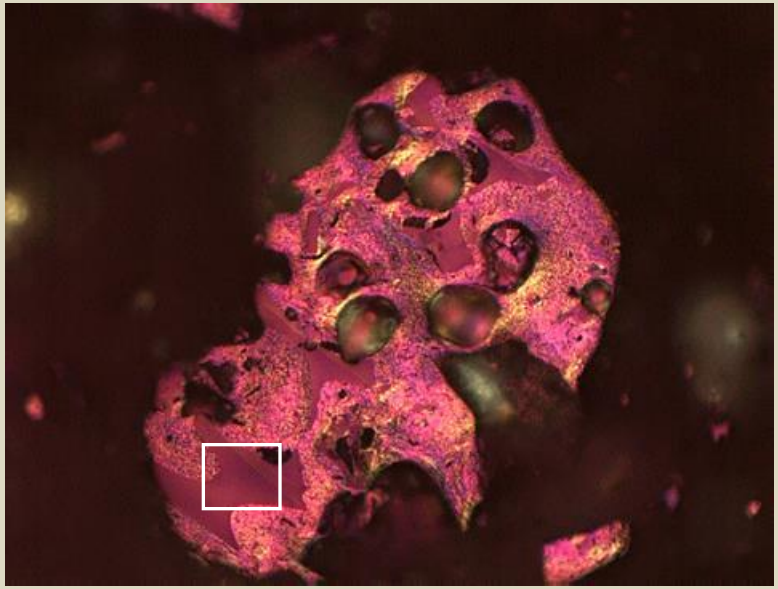


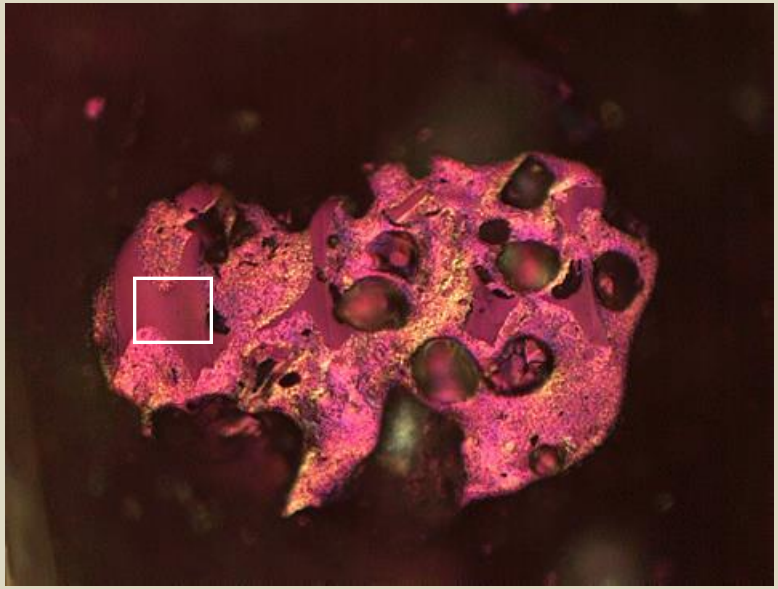
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Crassisphere**

Long side of the pictures: 200 microns

Stoker boiler Fly Ash

Unburned Carbon



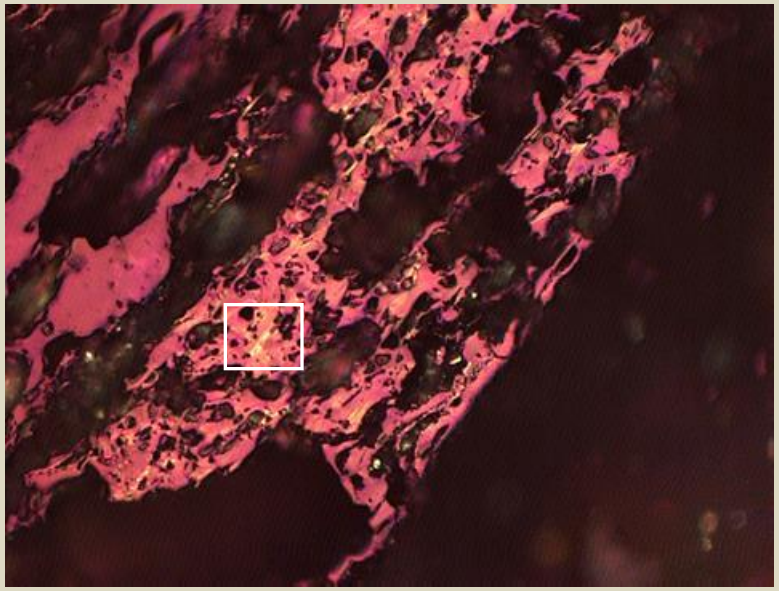


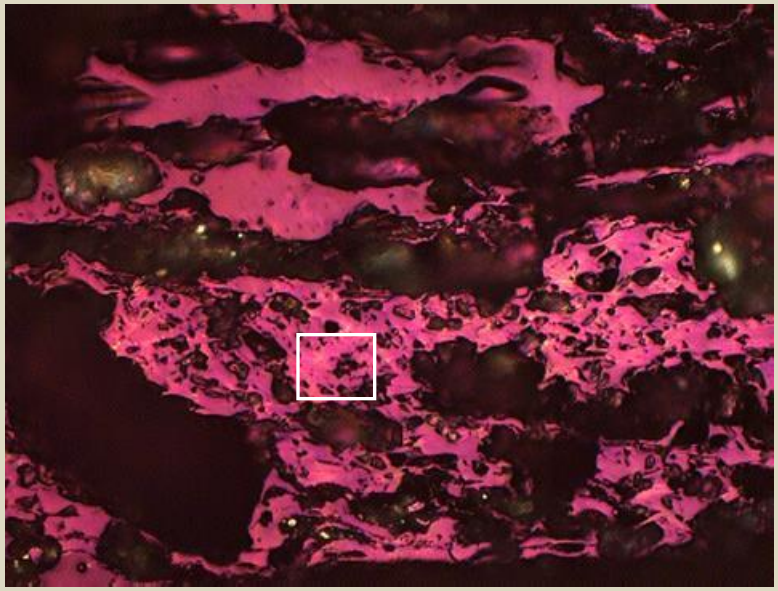
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**-**

Long side of the pictures: 200 microns

Stoker boiler Fly Ash

Unburned Carbon



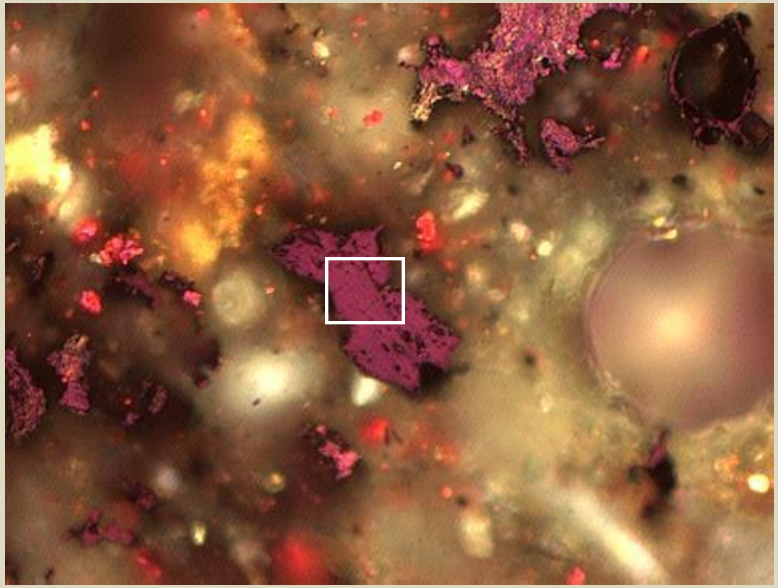


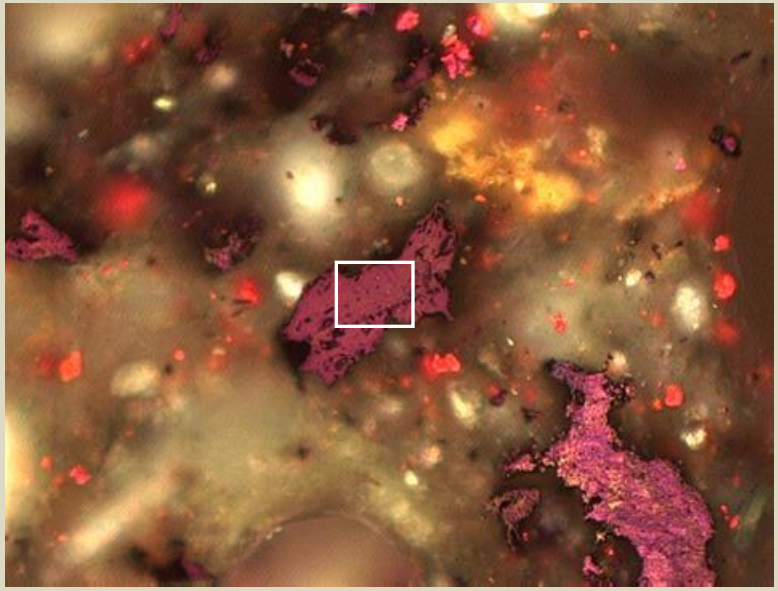
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**-**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Unburned Carbon



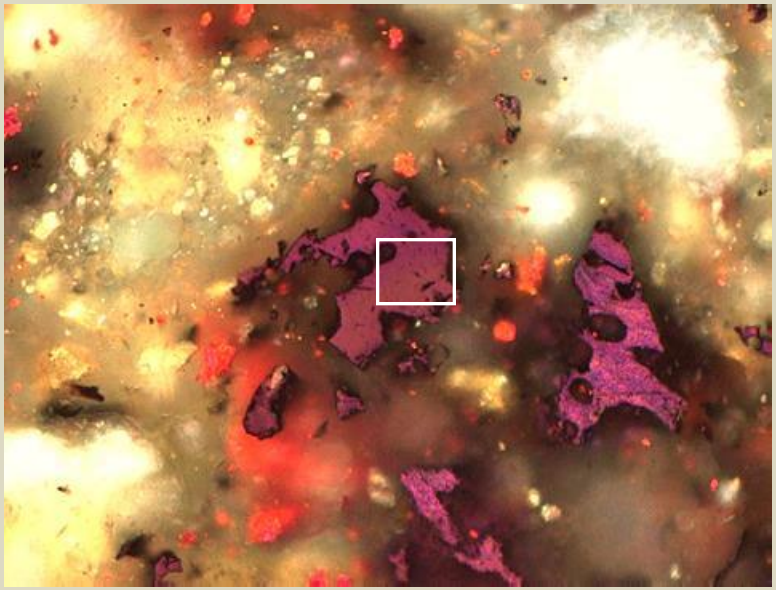


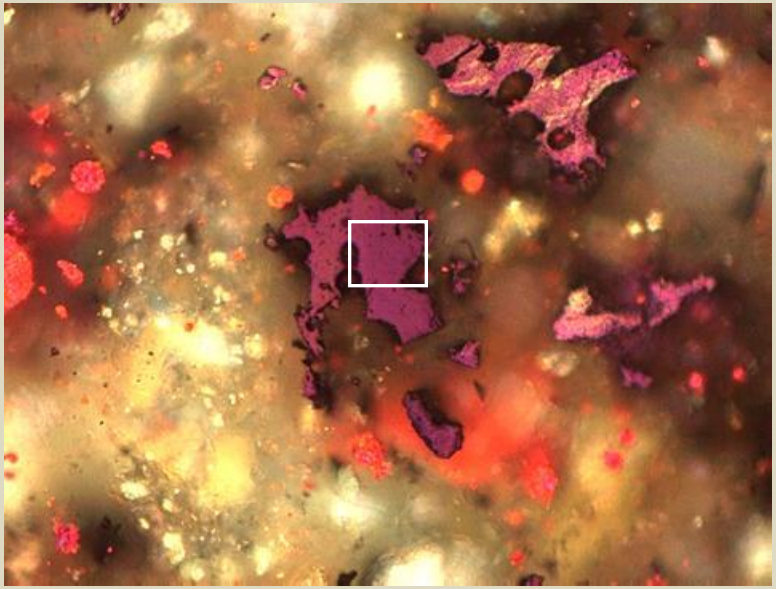
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**-**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Unburned Carbon



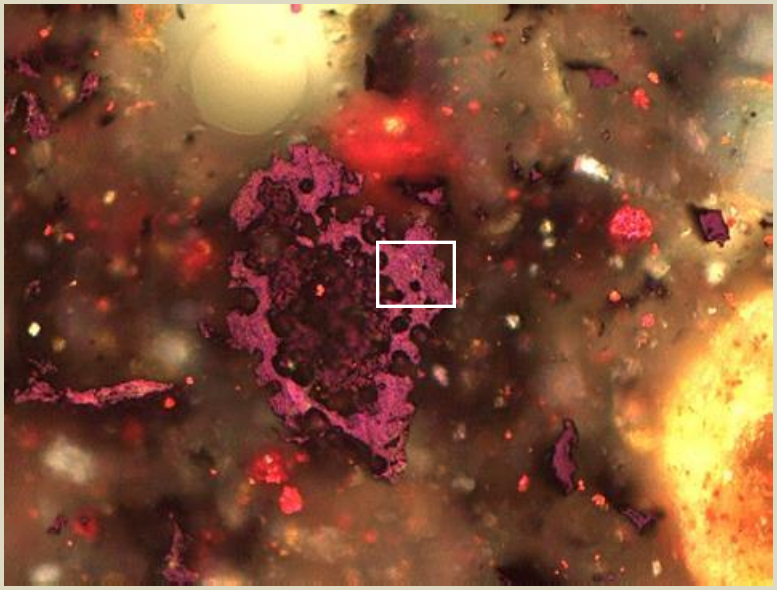


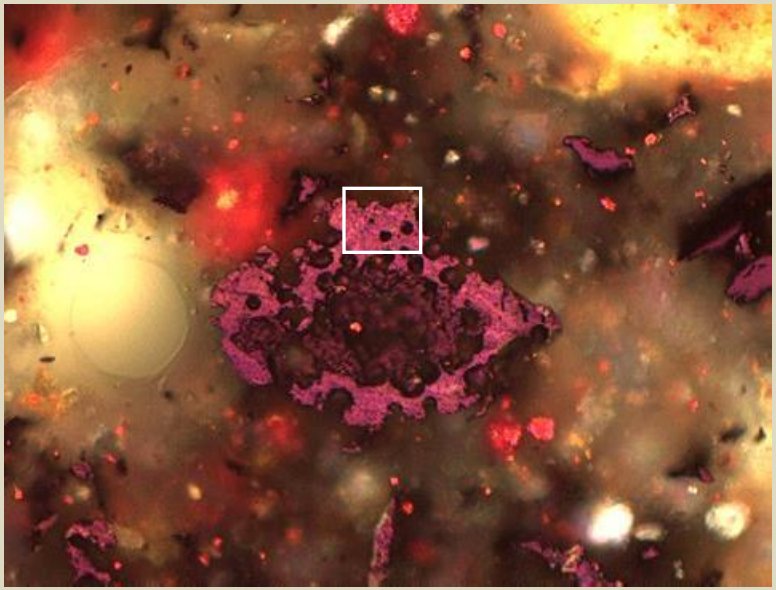
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**-**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Unburned Carbon



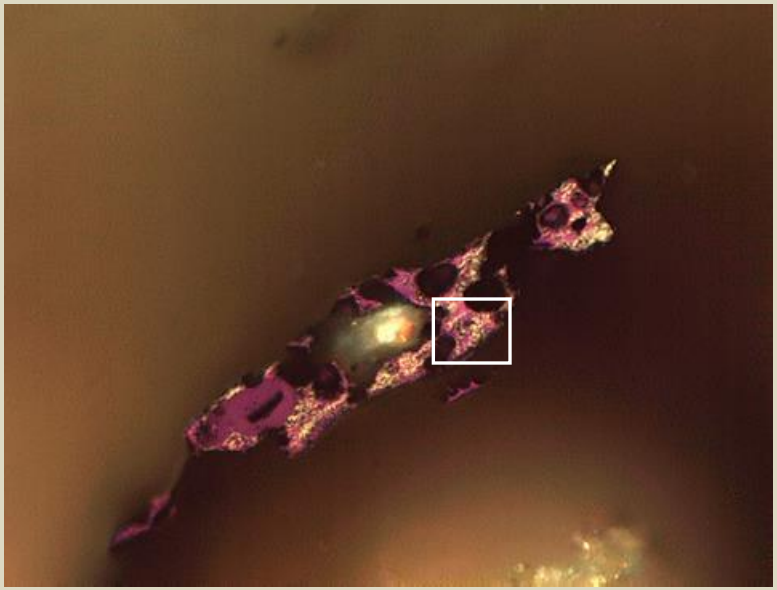


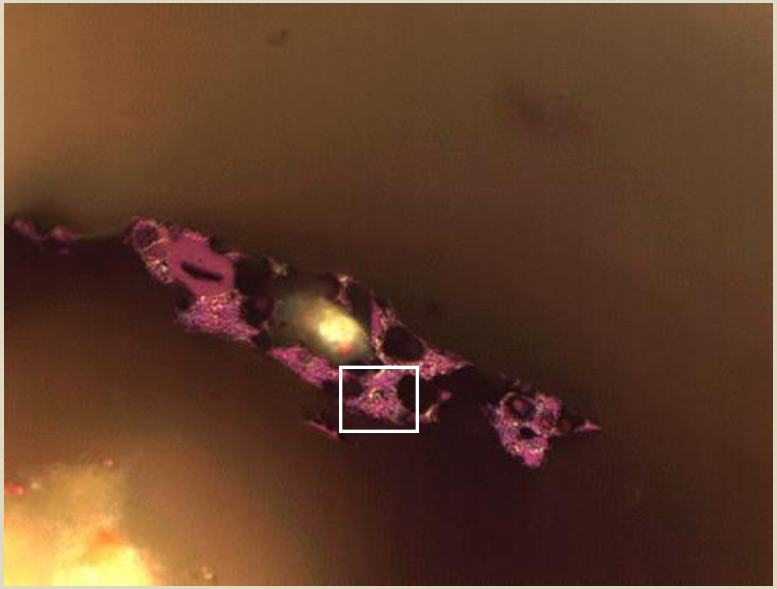
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal (Medium rank coal)**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Crassisphere**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
COAL TAILINGS + BIOMASS (wood pellets)

Unburned Carbon



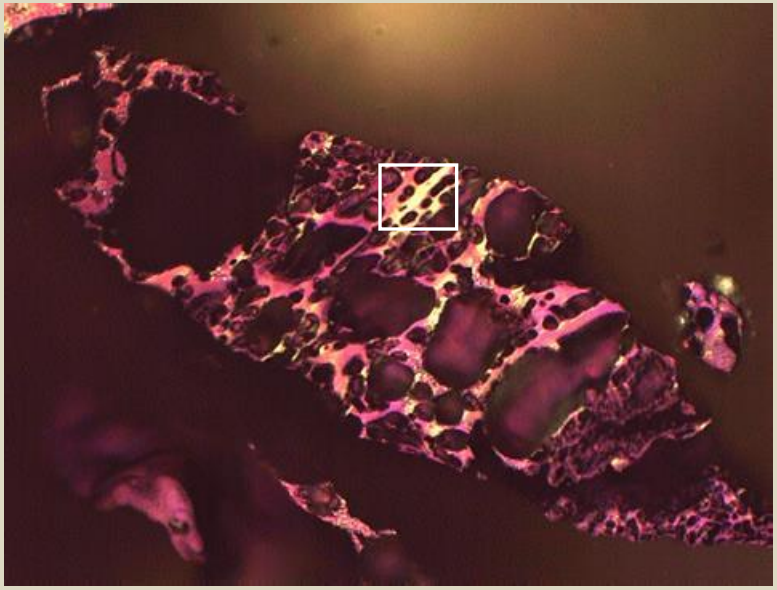


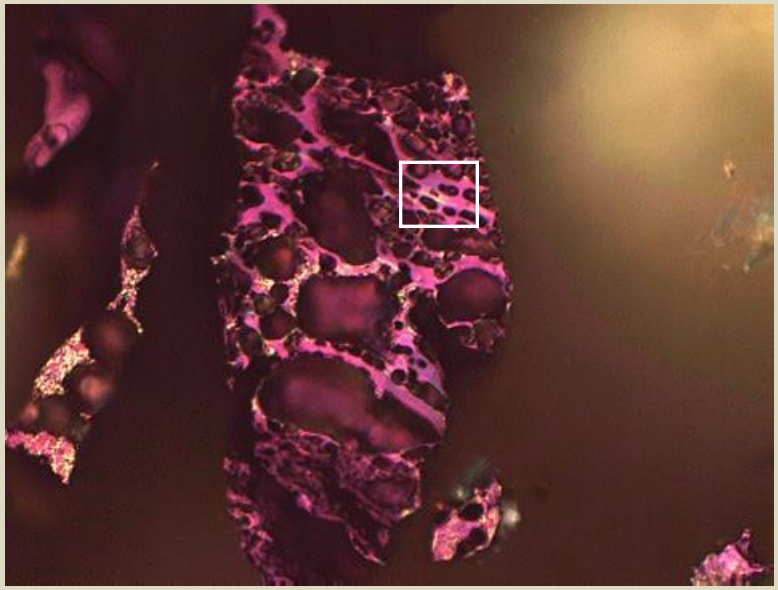
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal**
Level # 6: Type of particle (Char Classification): whole particle identification:	-

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
COAL TAILINGS + BIOMASS (wood pellets)

Unburned Carbon



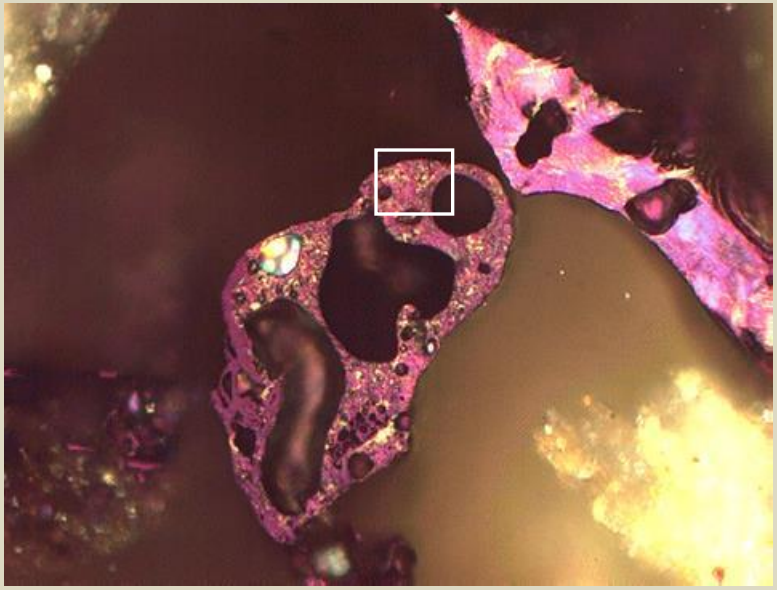


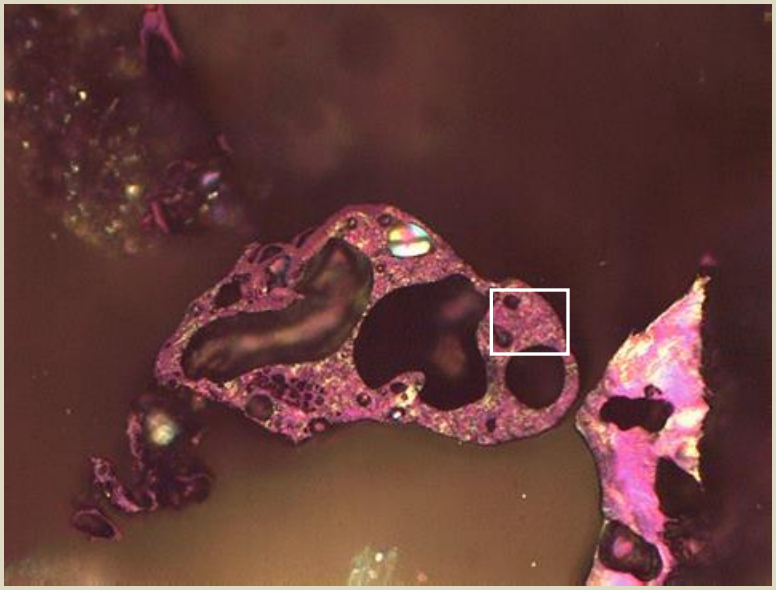
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Tenuinetwork**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
COAL TAILINGS + BIOMASS (wood pellets)

Unburned Carbon



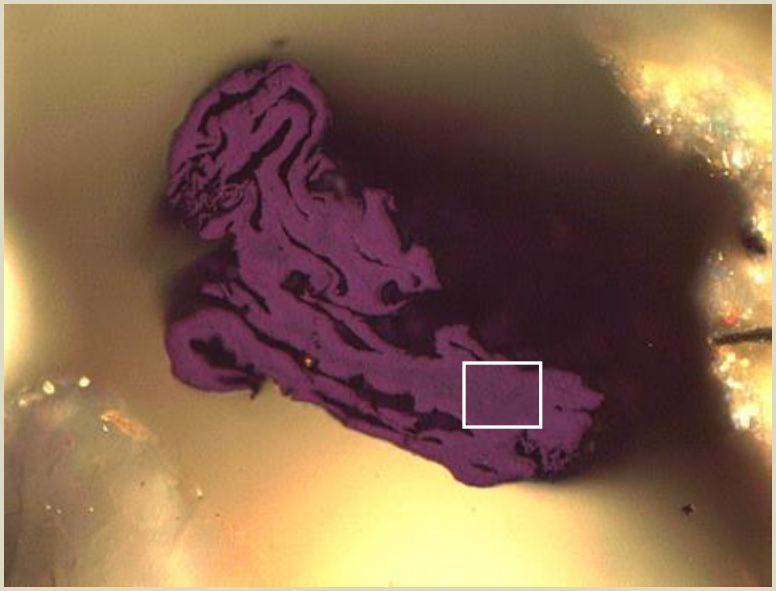


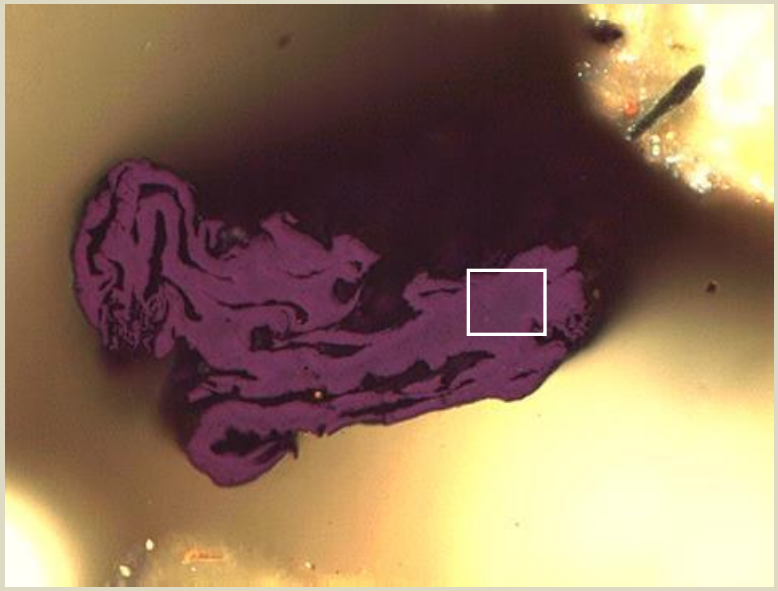
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Anisotropic**
Level # 5- Origin: whole particle identification:	**Coal**
Level # 6: Type of particle (Char Classification): whole particle identification:	**Crassisphere**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
BIOMASS (wood pellets)

Unburned Carbon



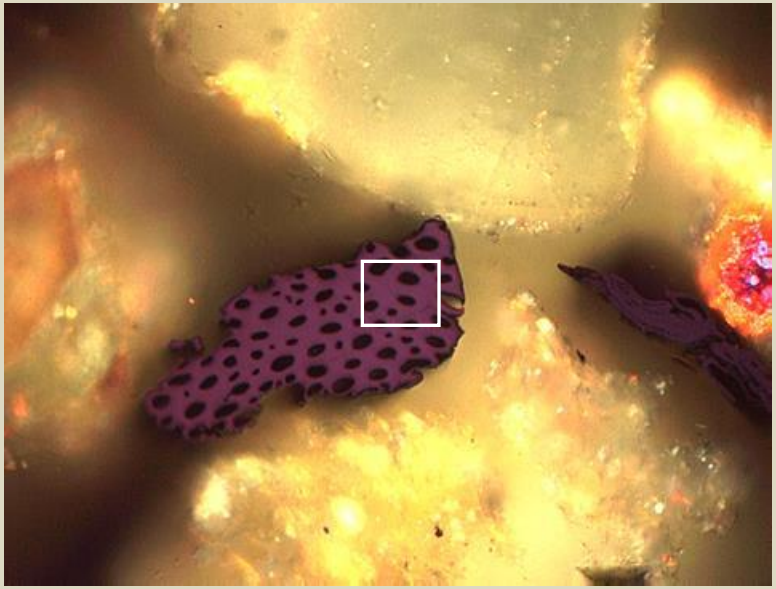


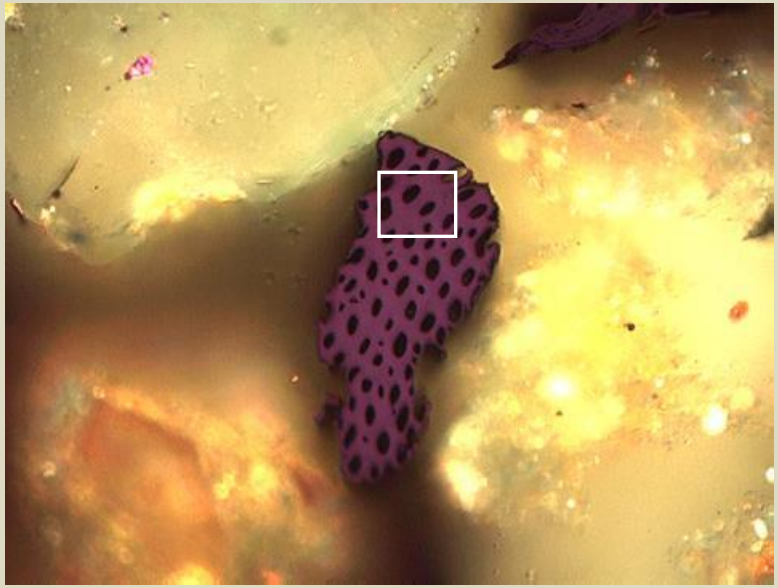
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Dense**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Biomass**
Level # 6: Type of particle (Char Classification): whole particle identification:	-

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
BIOMASS (wood pellets)

Unburned Carbon



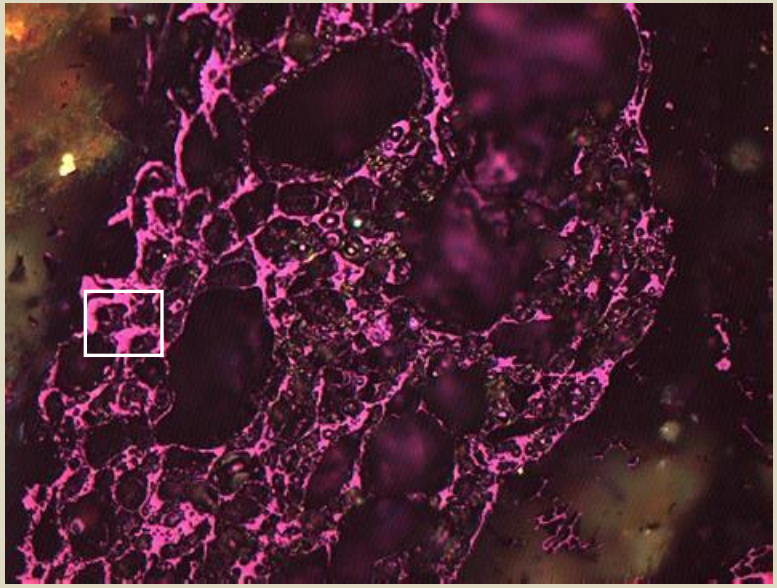


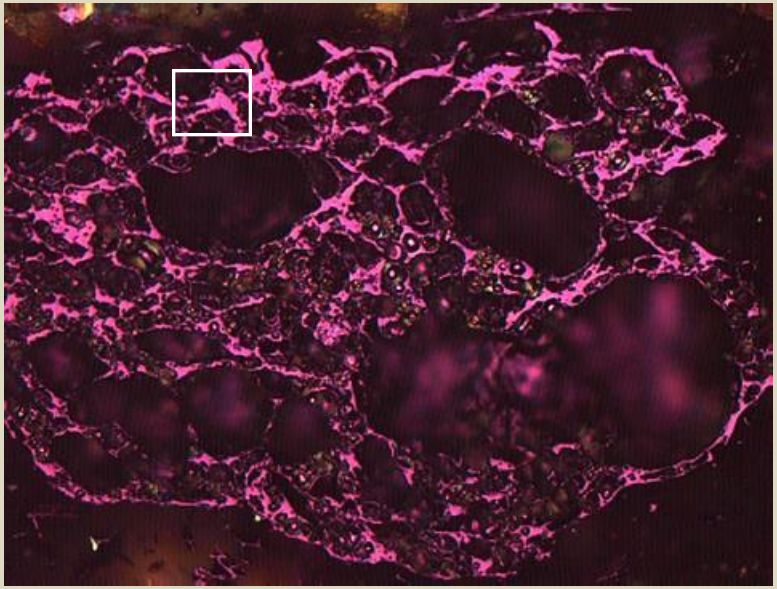
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Biomass**
Level # 6: Type of particle (Char Classification): whole particle identification:	-

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
BIOMASS (Eucalyptus)

Unburned Carbon



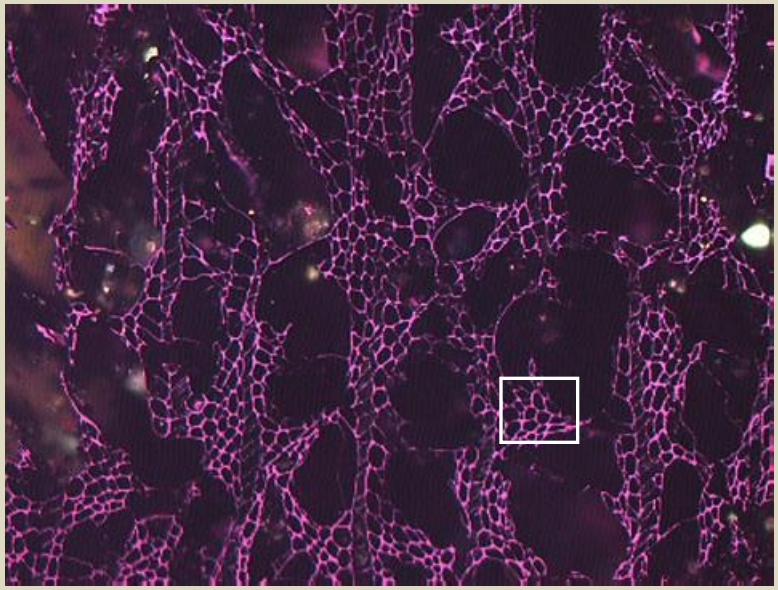


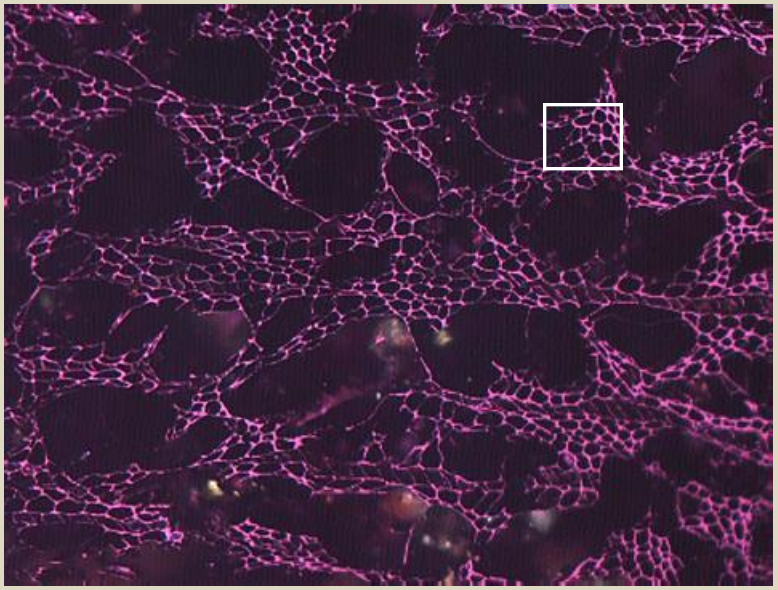
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Biomass**
Level # 6: Type of particle (Char Classification): whole particle identification:	-

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
BIOMASS (Eucalyptus)

Unburned Carbon



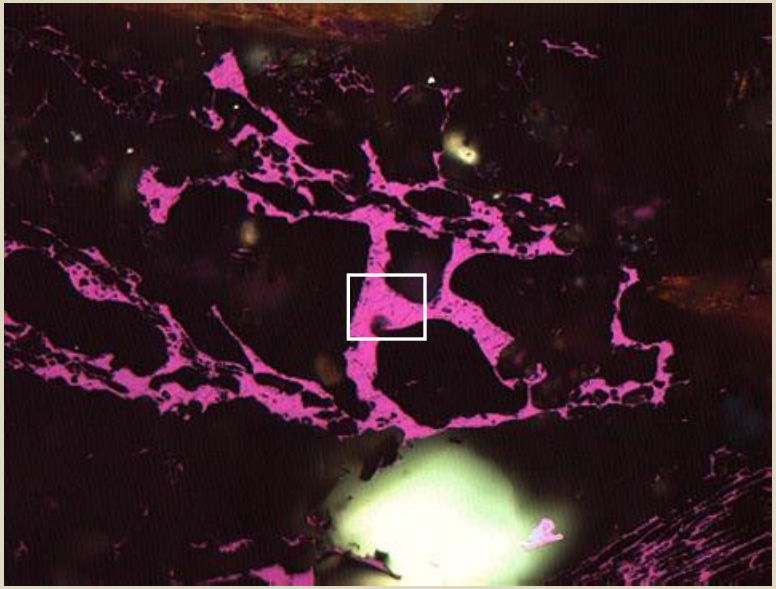


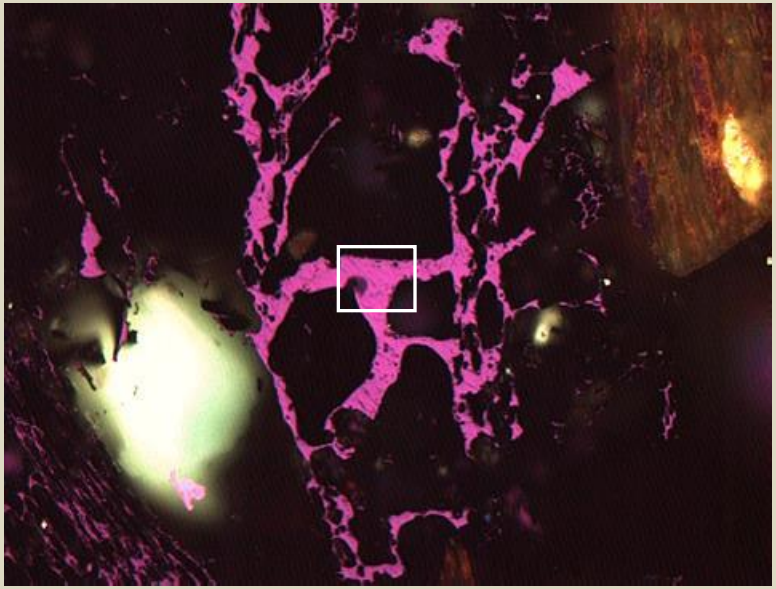
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Biomass**
Level # 6: Type of particle (Char Classification): whole particle identification:	-

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
BIOMASS (Eucalyptus)

Unburned Carbon



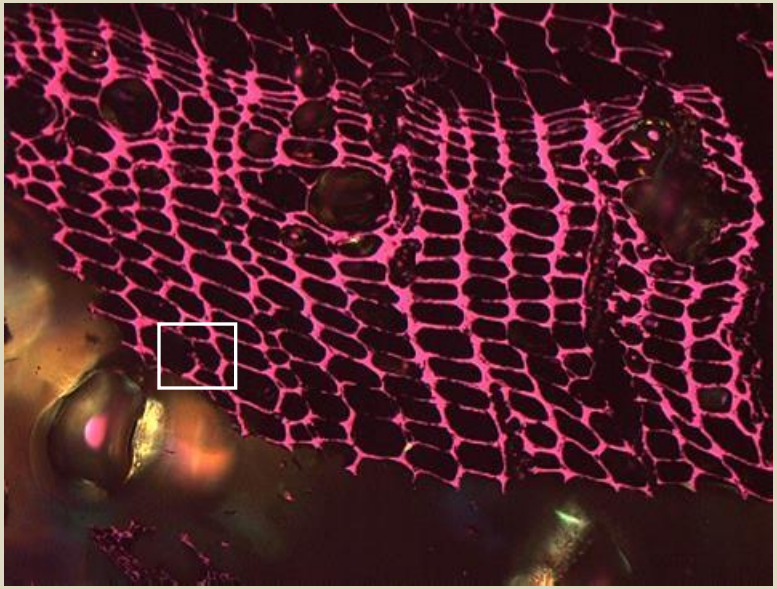


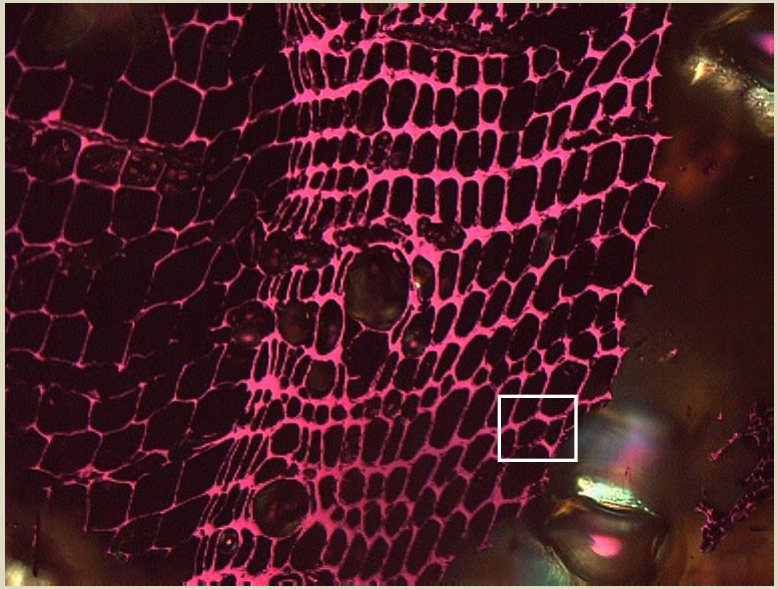
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Biomass**
Level # 6: Type of particle (Char Classification): whole particle identification:	-

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash
FOREST BIOMASS (Eucalyptus)

Unburned Carbon



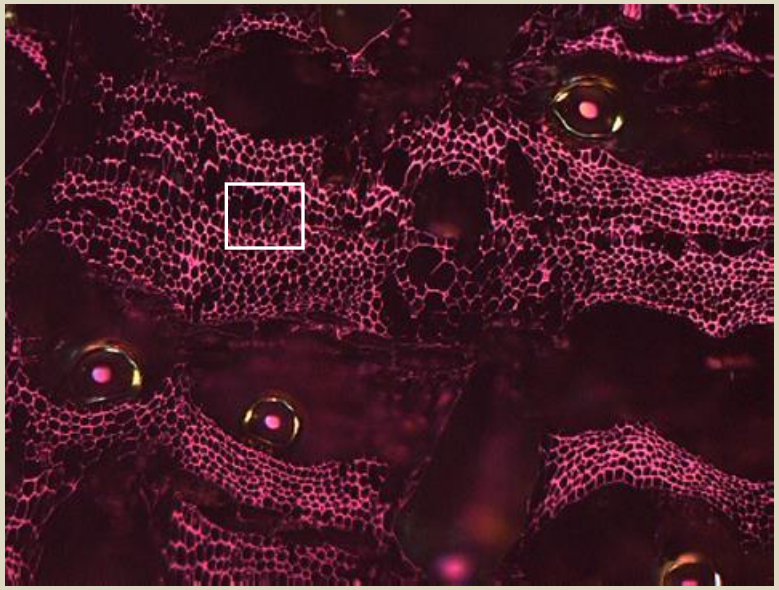


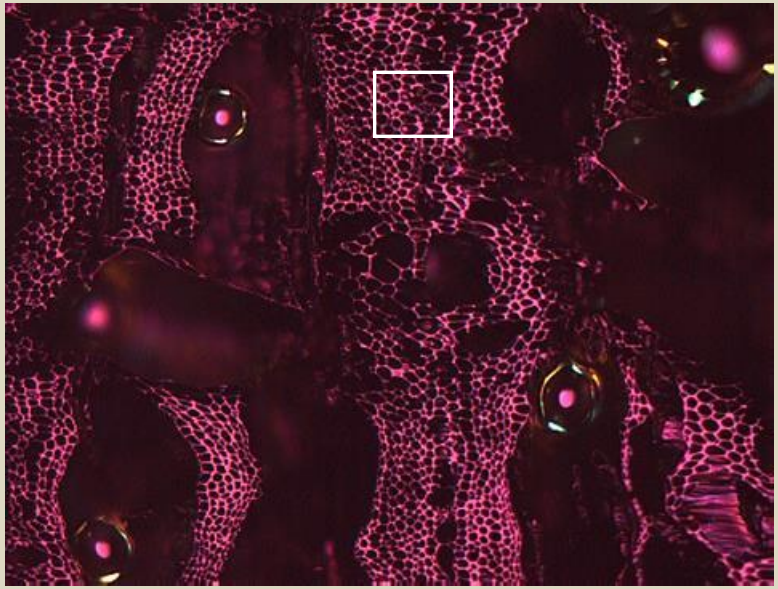
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Biomass**
Level # 6: Type of particle (Char Classification): whole particle identification:	-

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash
FOREST BIOMASS (Eucalyptus)

Unburned Carbon



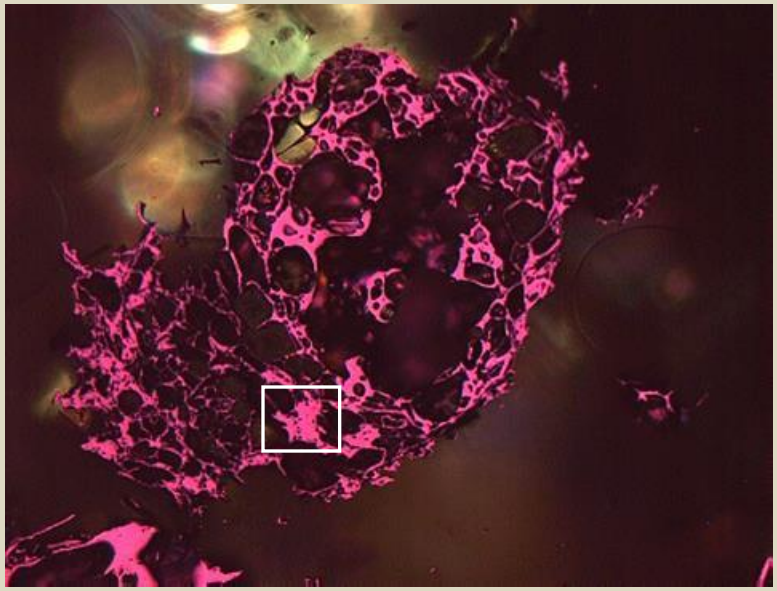


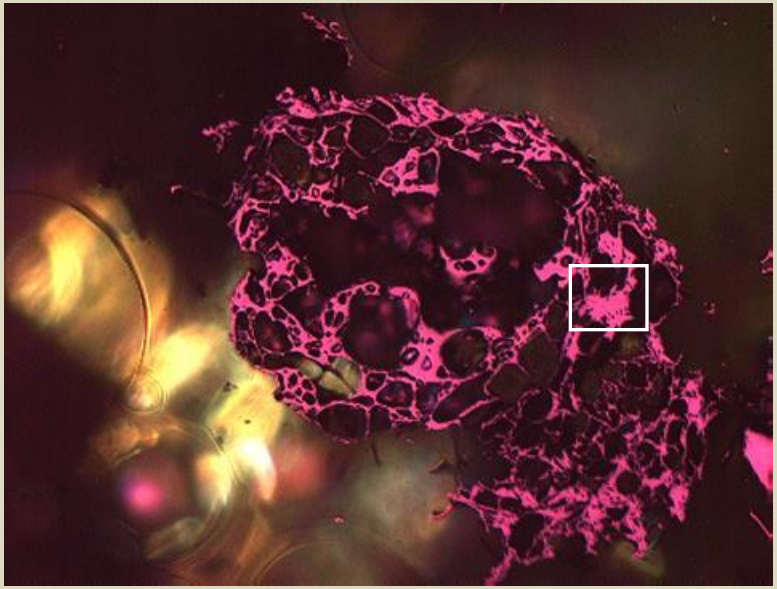
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Biomass**
Level # 6: Type of particle (Char Classification): whole particle identification:	-

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash
FOREST BIOMASS (Eucalyptus)

Unburned Carbon



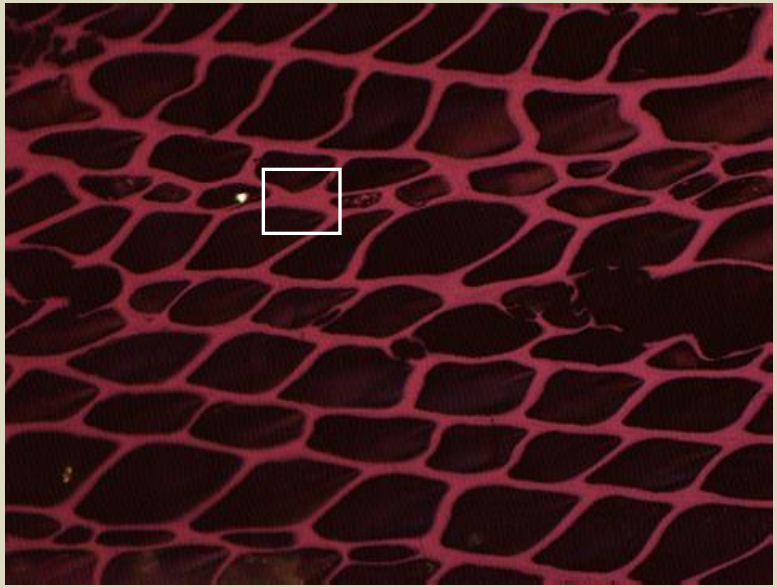


Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Fused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Biomass**
Level # 6: Type of particle (Char Classification): whole particle identification:	-

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash
FOREST BIOMASS (Eucalyptus)

Unburned Carbon

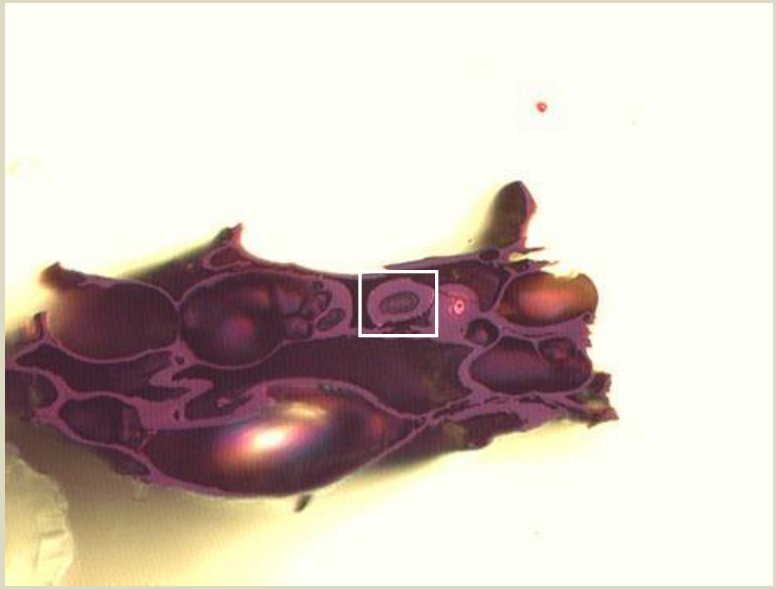


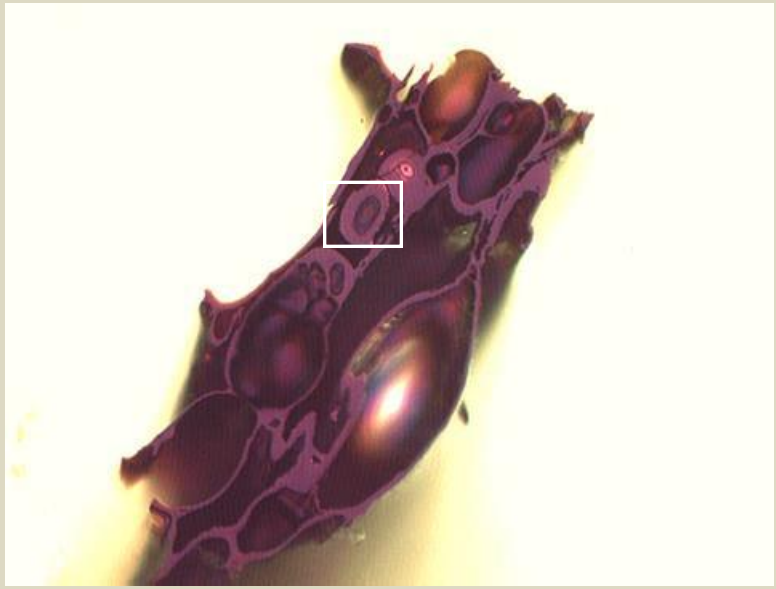
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Biomass**
Level # 6: Type of particle (Char Classification): whole particle identification:	-

Long side of the pictures: 200 microns

Other
BIOMASS (Sawdust)

Unburned Carbon



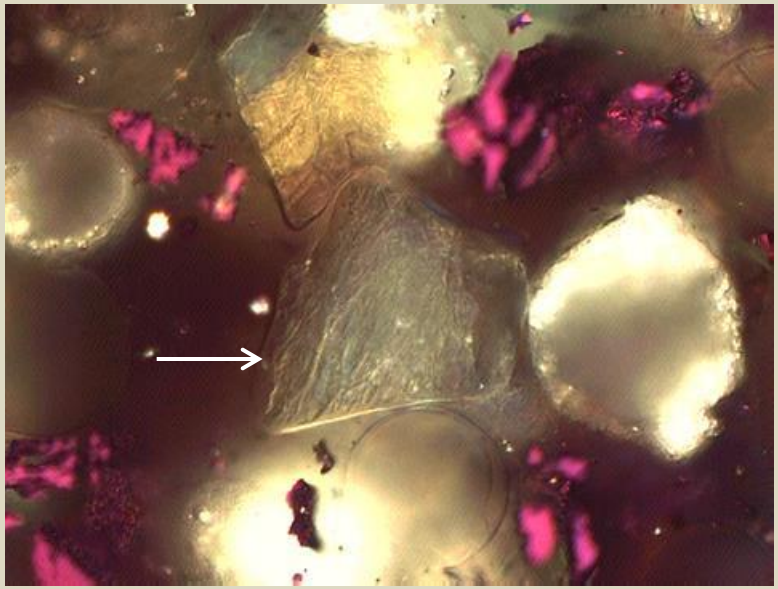


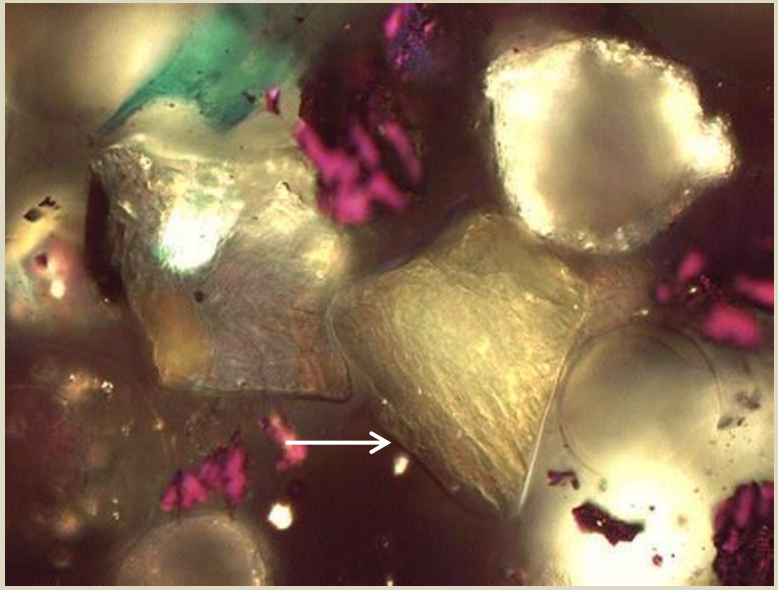
Level # 1- Nature: whole particle identification:	**Organic**
Level # 2- Character: particle field identification:	**Unfused**
Level # 3- Structure/Morphology: particle field identification:	**Porous**
Level # 4- Optical texture: particle field identification:	**Isotropic**
Level # 5- Origin: whole particle identification:	**Biomass**
Level # 6: Type of particle (Char Classification): whole particle identification:	-

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Inorganics



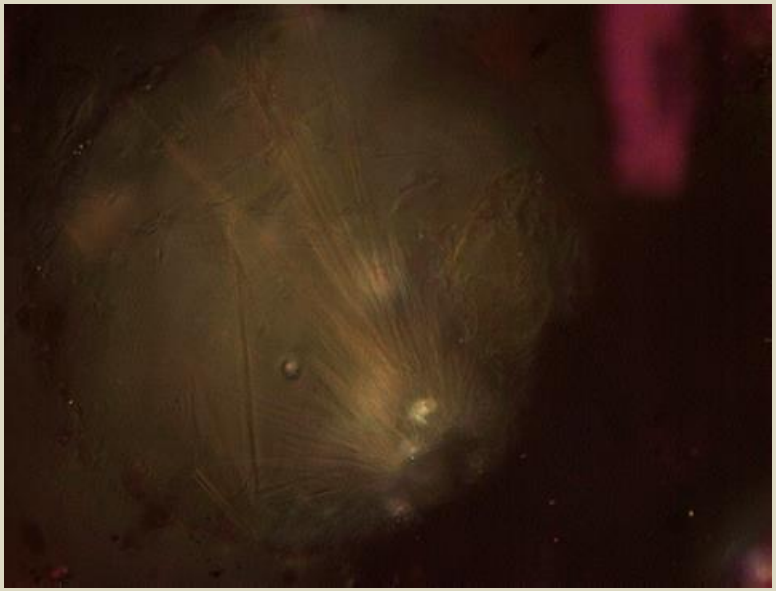


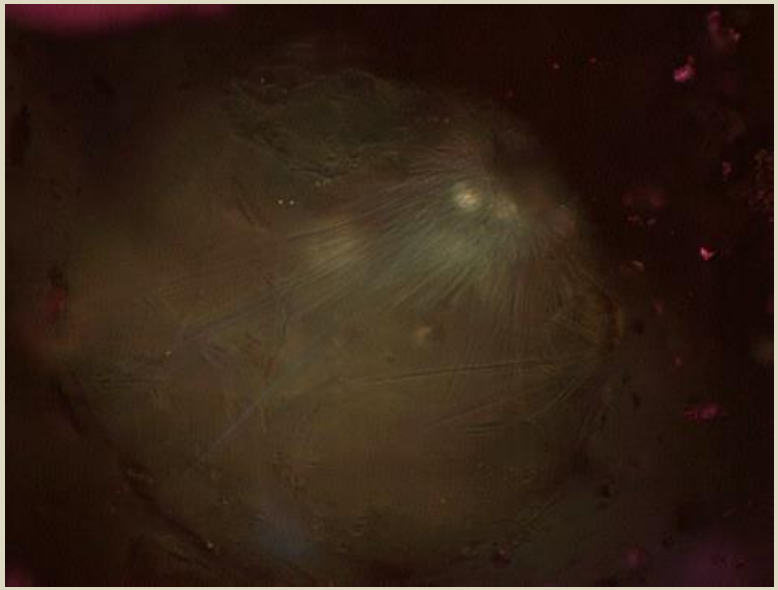
Origin	**High rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Inorganics



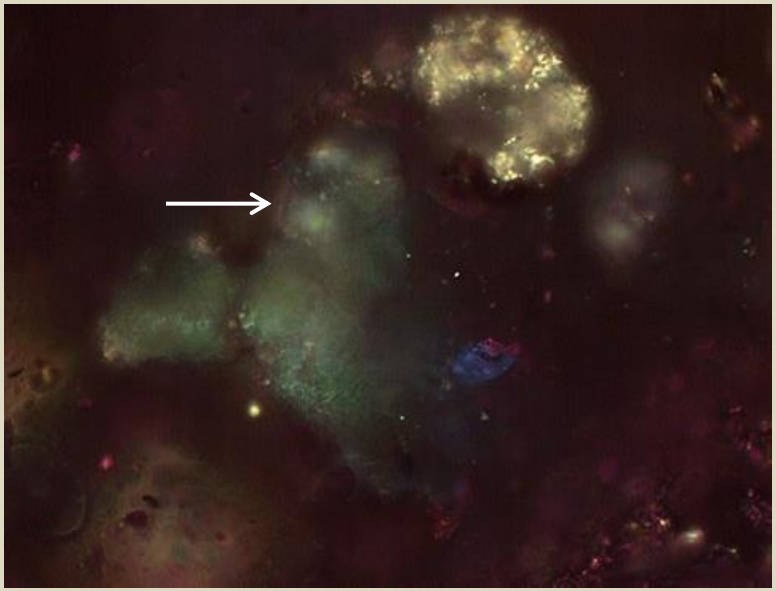


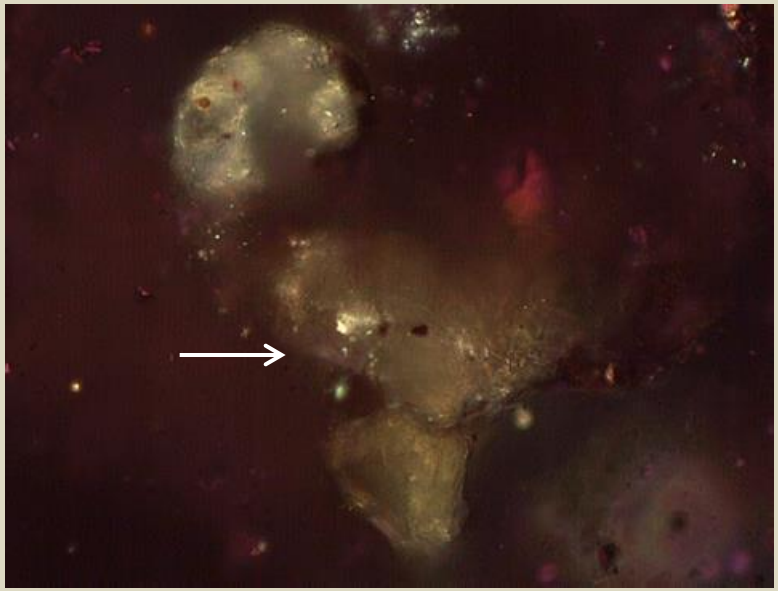
Origin	**High rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Inorganics



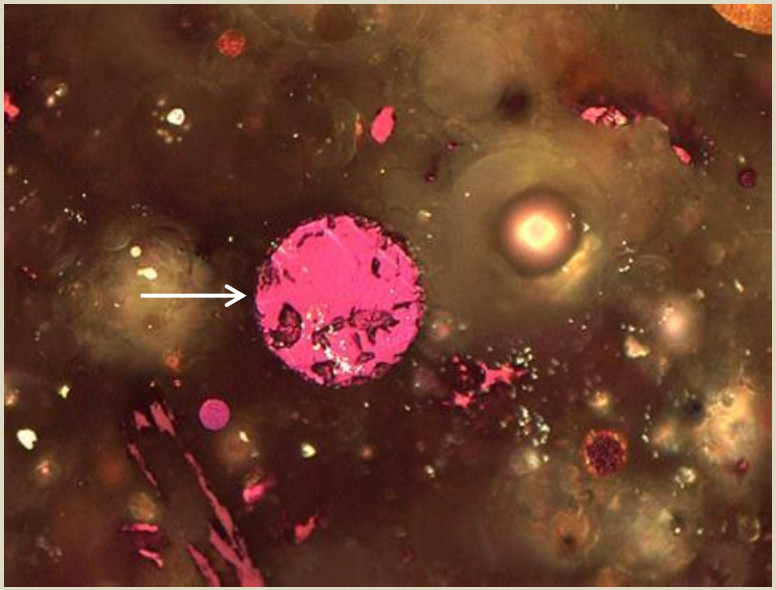


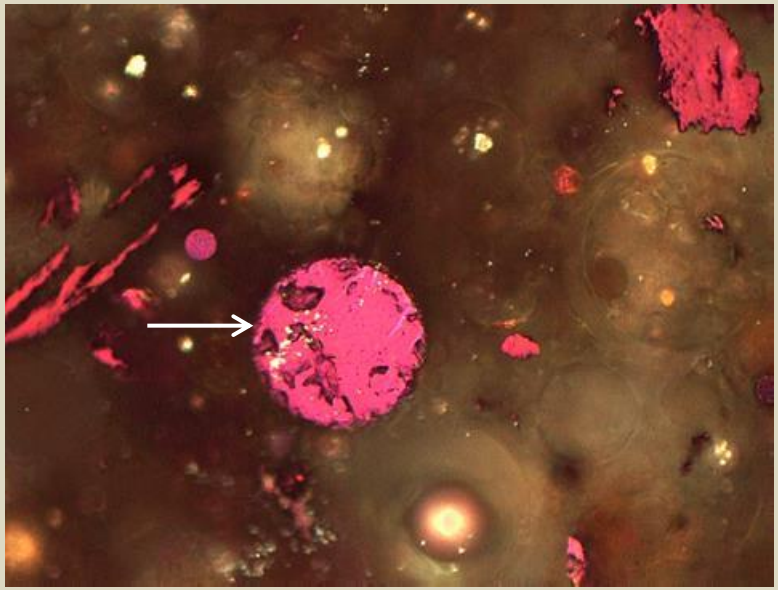
Origin	**High rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Inorganics



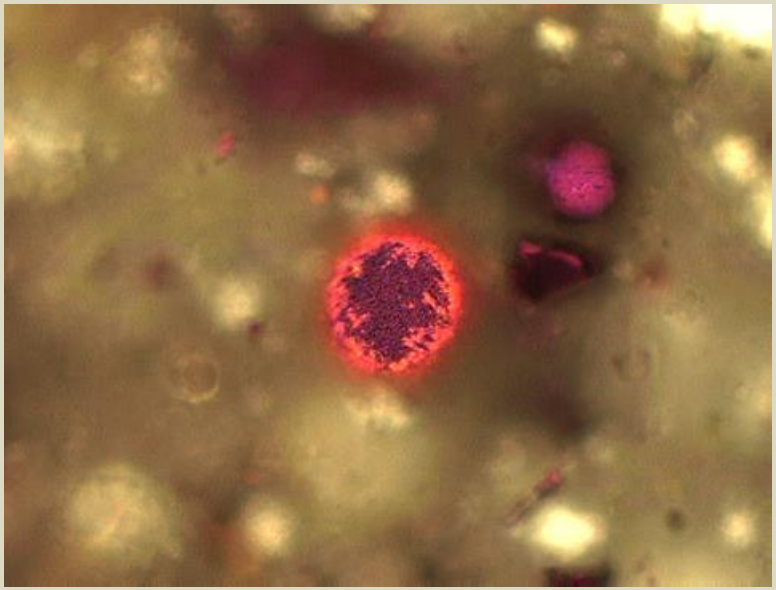


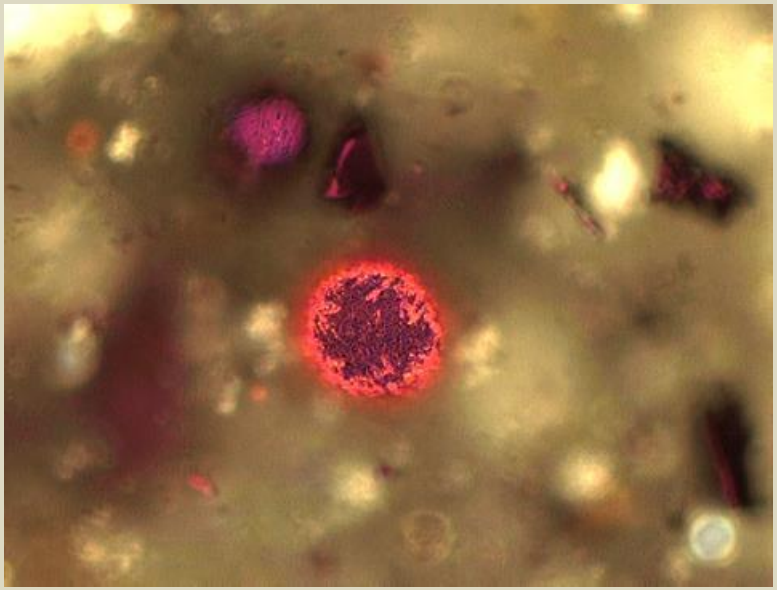
Origin	**High rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Inorganics



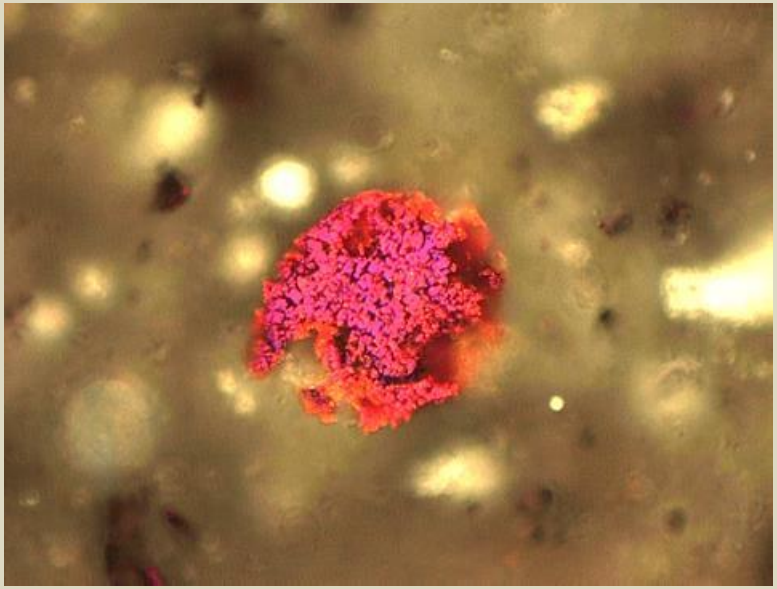


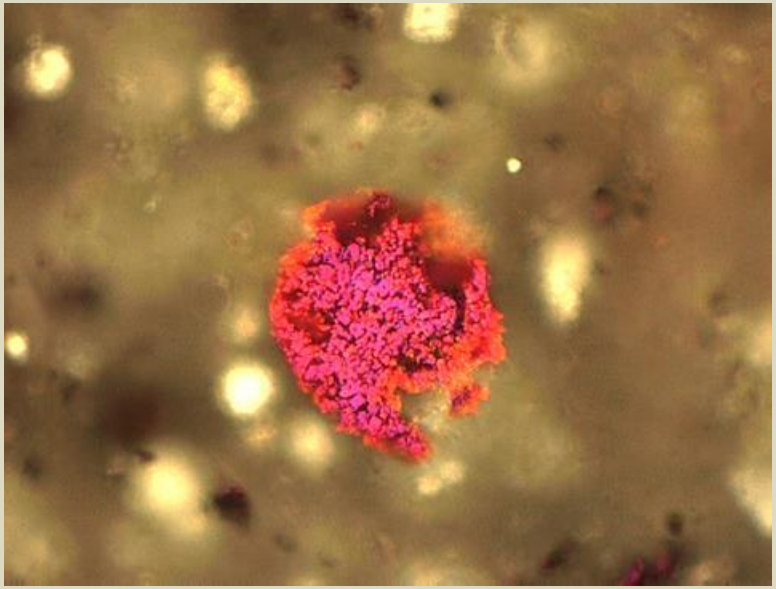
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Inorganics



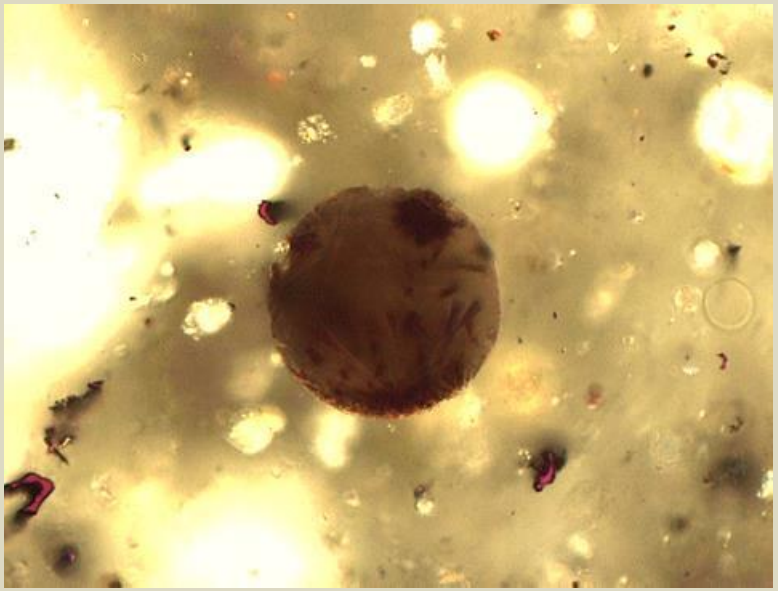


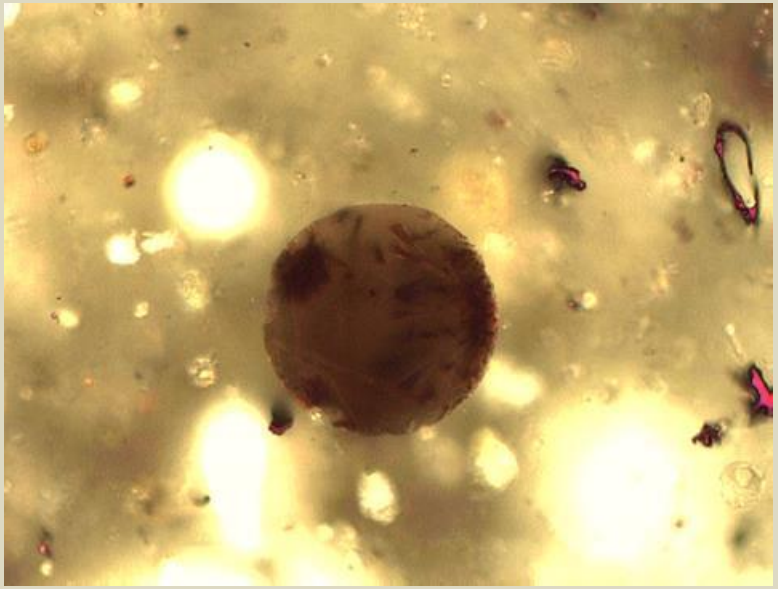
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Inorganics



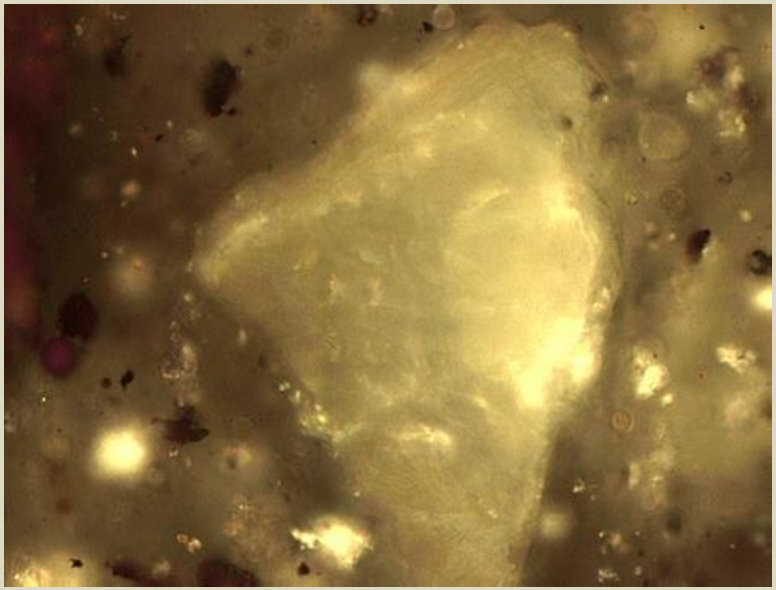


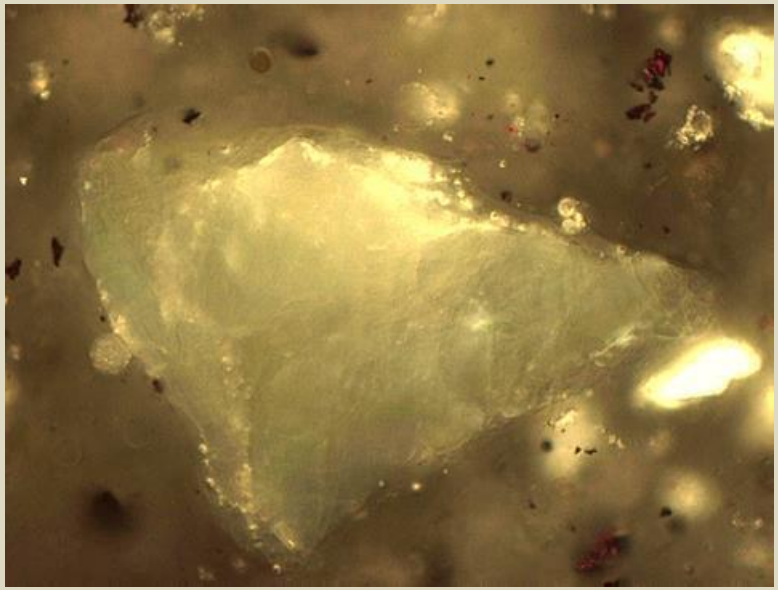
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Inorganics



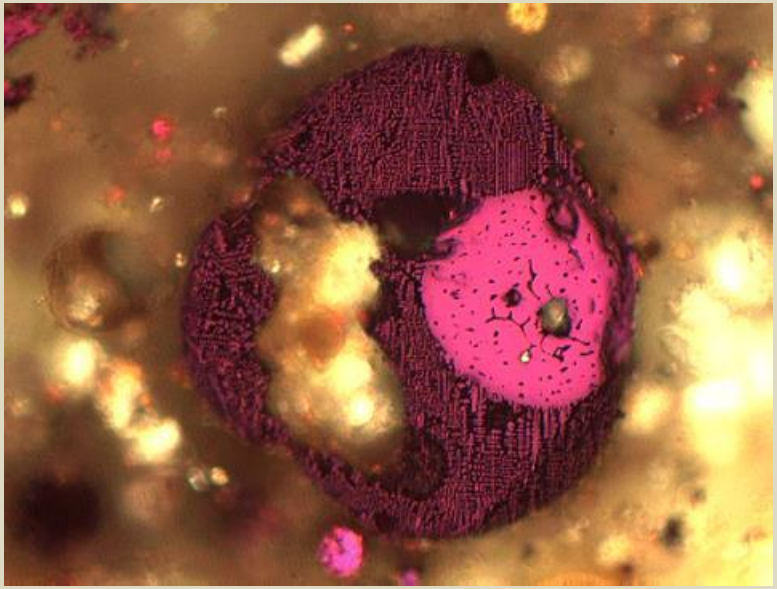


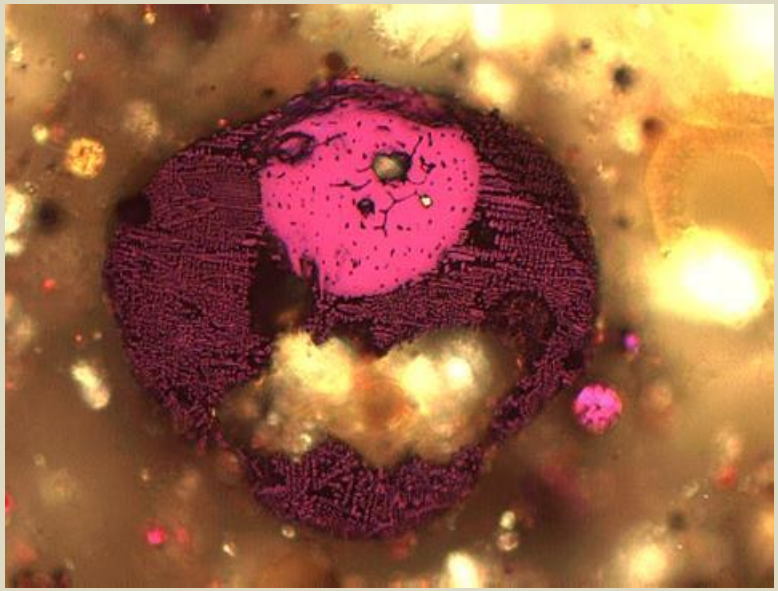
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Inorganics



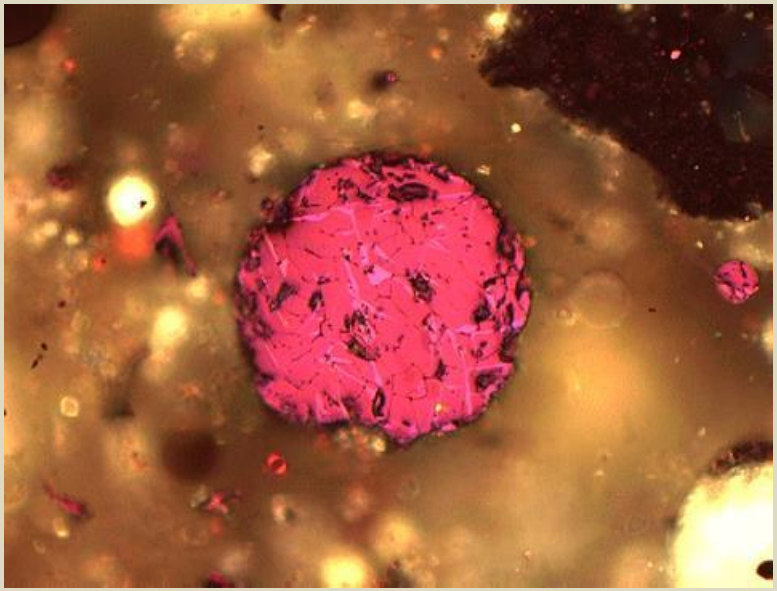


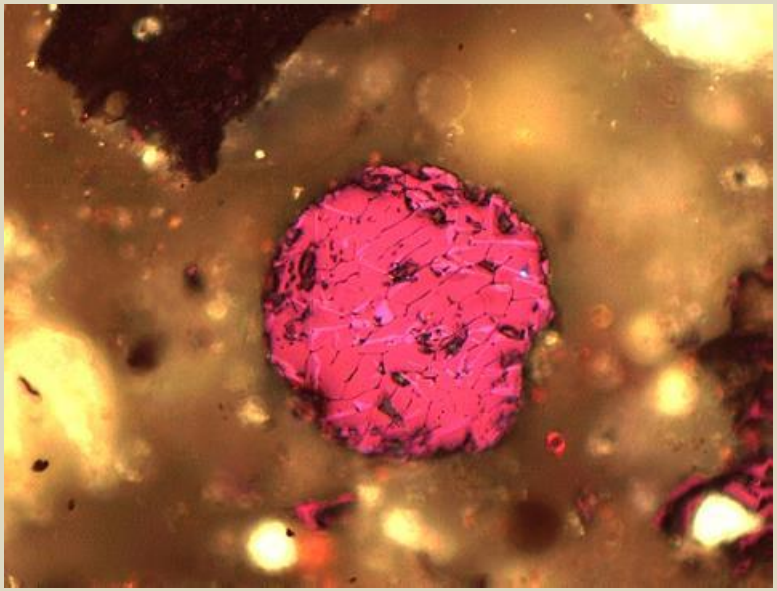
Origin	**Low rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Inorganics



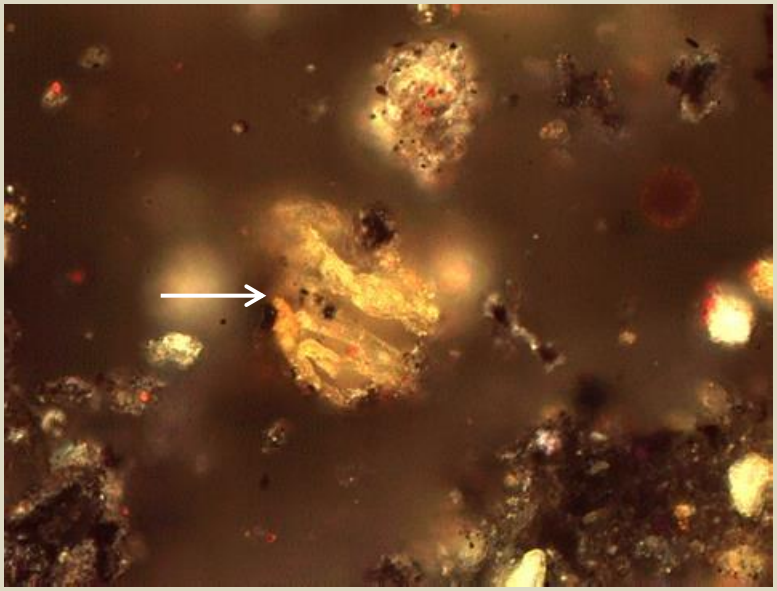


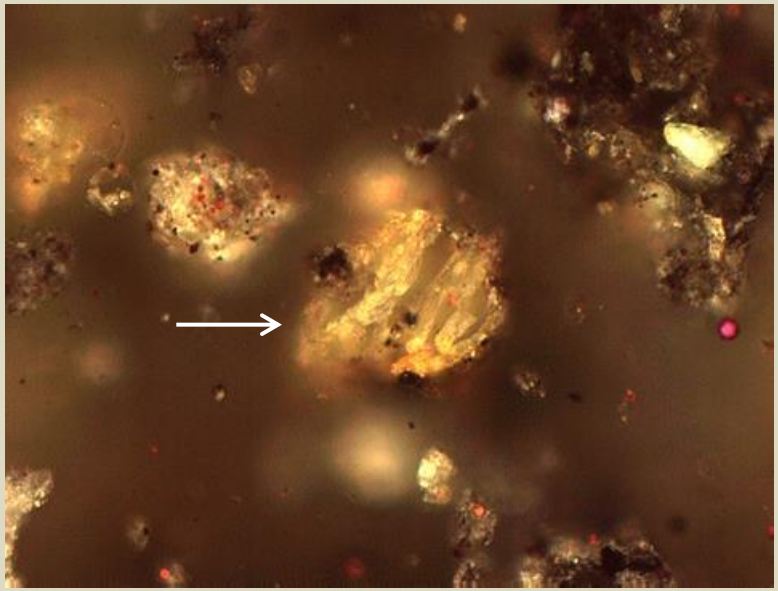
Origin	**Low rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Inorganics



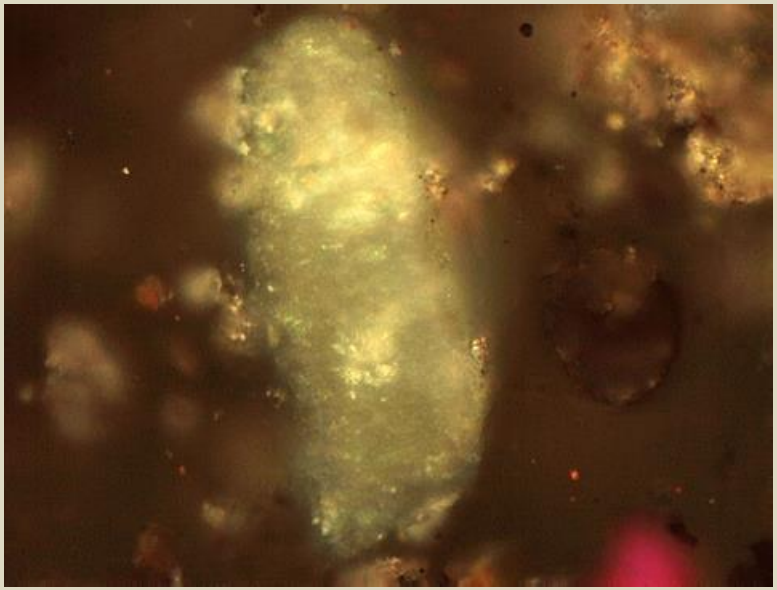


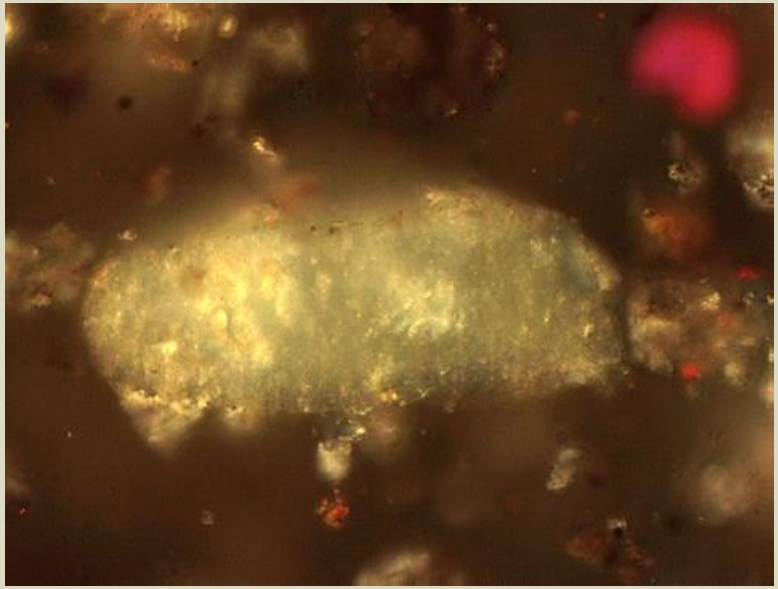
Origin	**Low rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Inorganics





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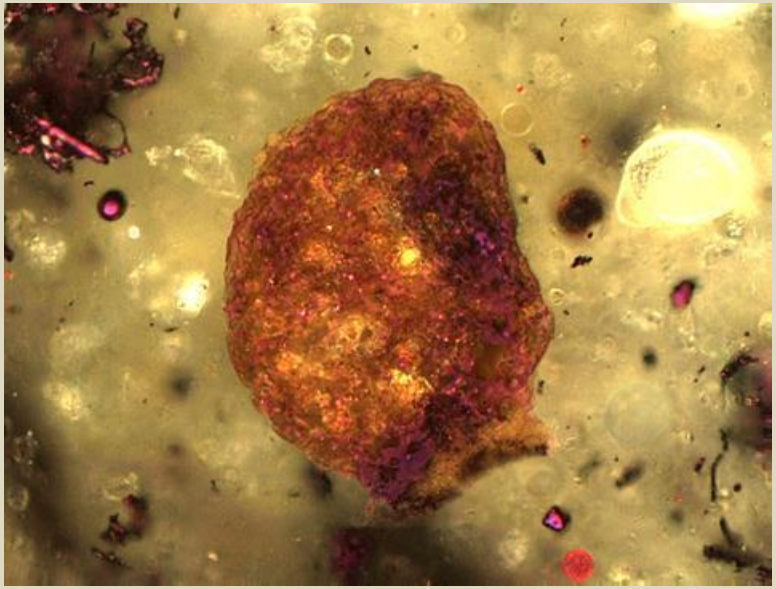
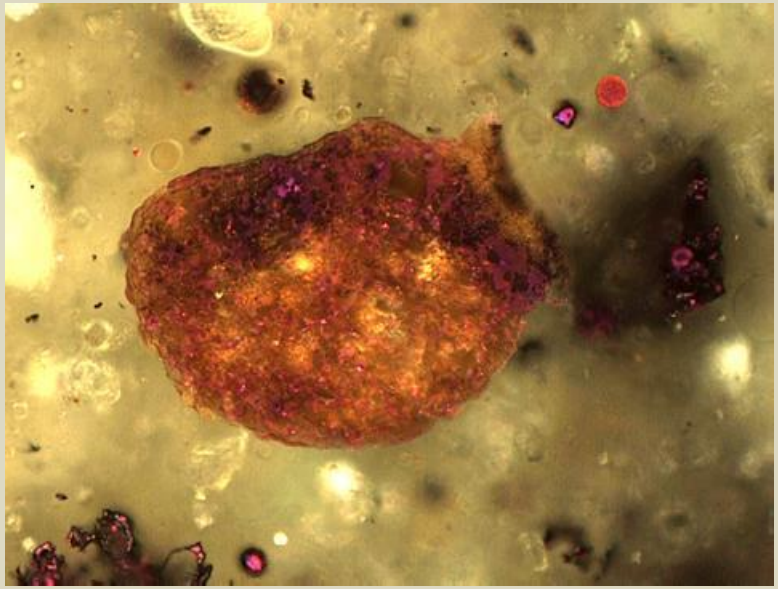
Pulverized Coal Combustion Fly Ash

Inorganics





Origin	**Low rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
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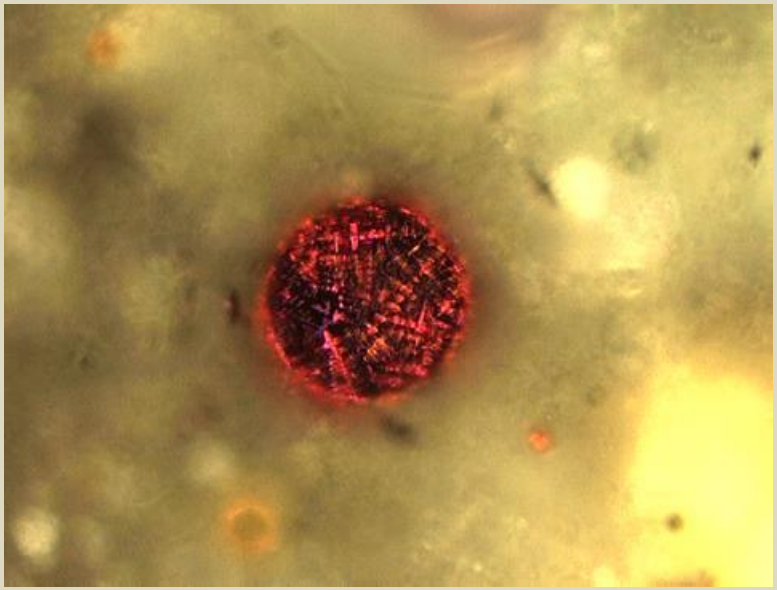
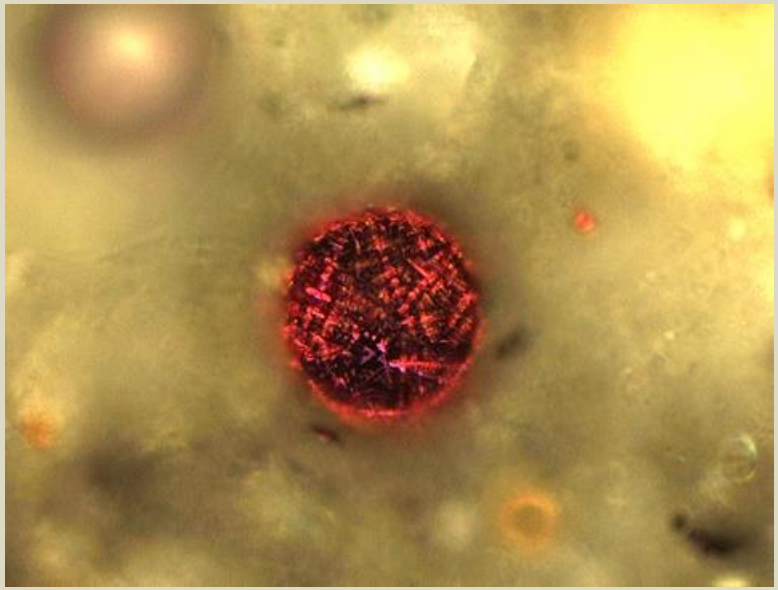
Pulverized Coal Combustion Fly Ash

Inorganics



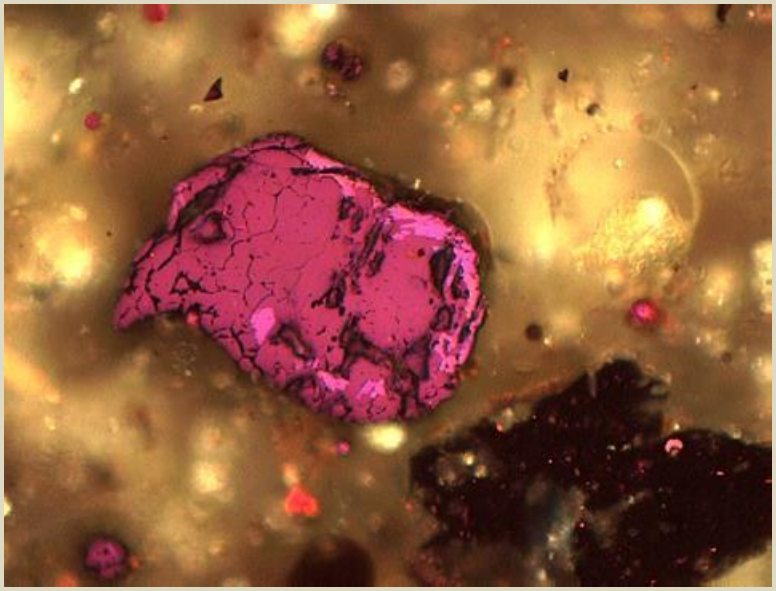


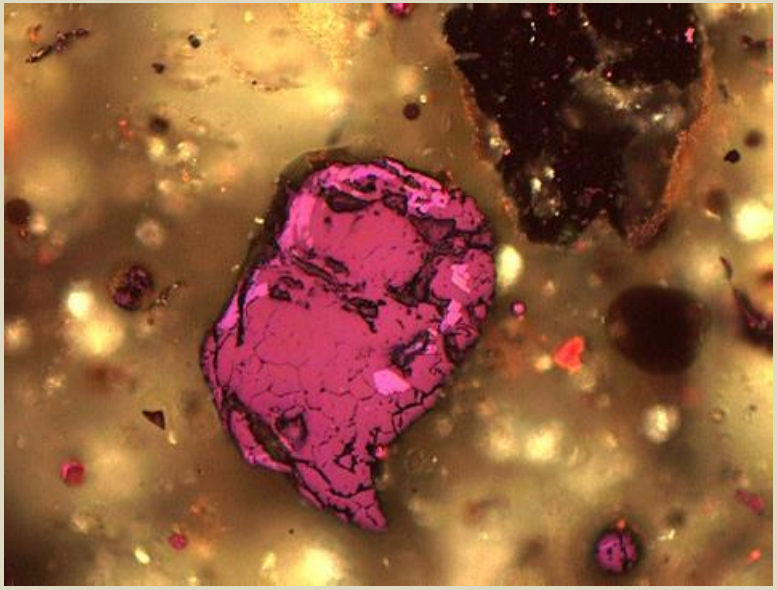
Origin	**Low rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Inorganics





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Level # 1 - Nature: whole particle identification:	**Inorganic**
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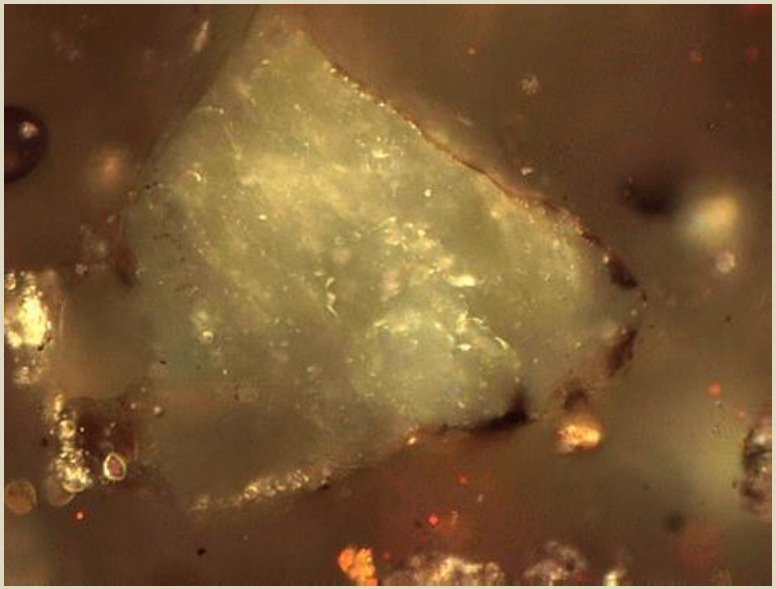
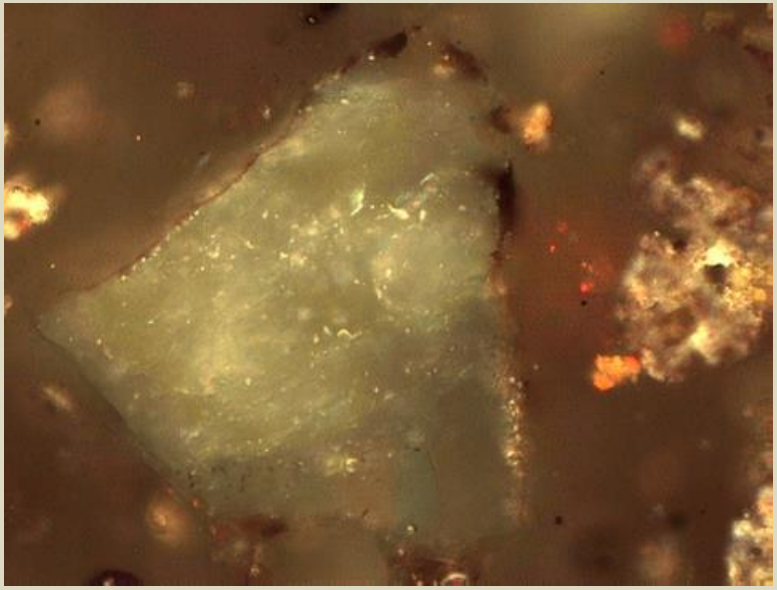
Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Inorganics





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Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
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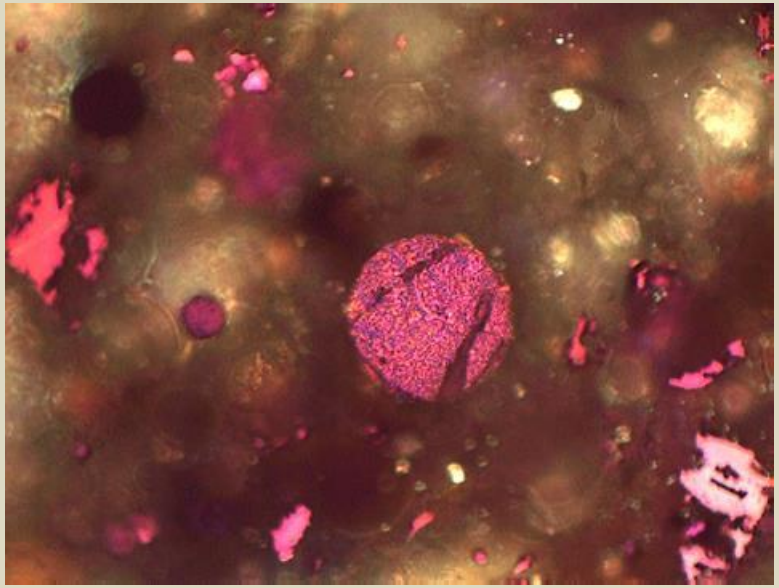
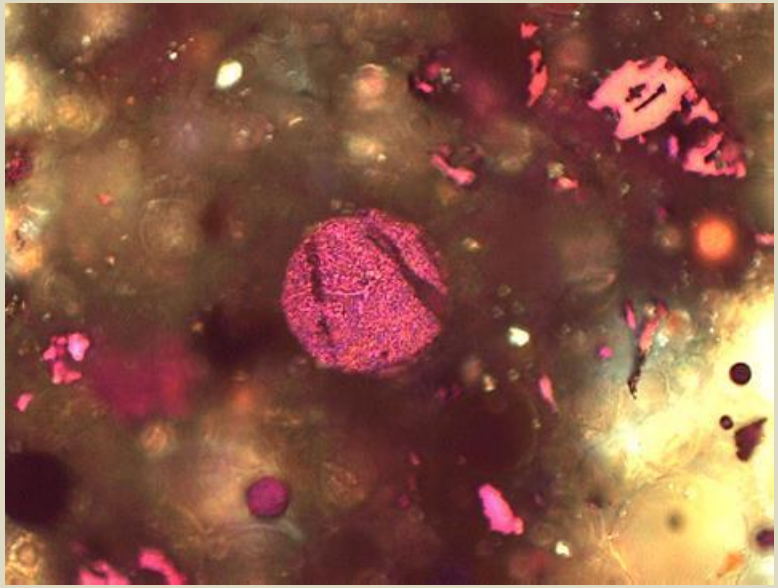
Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash

Inorganics



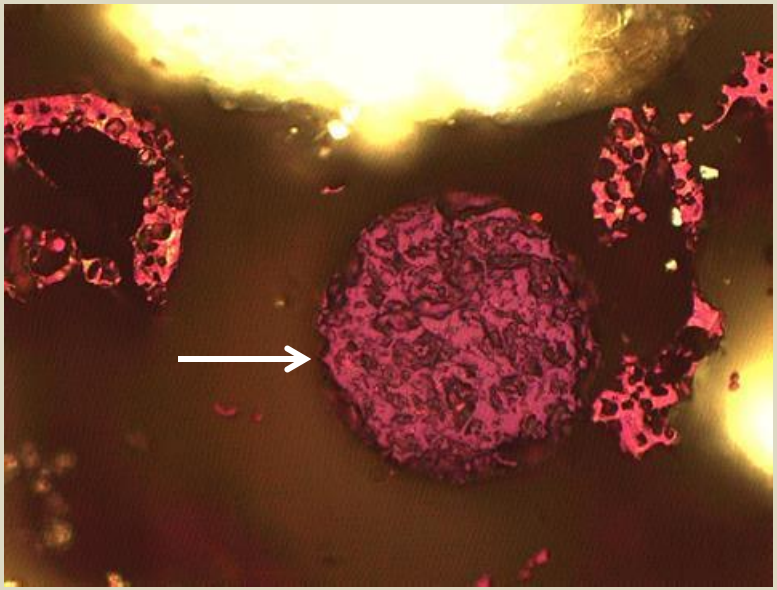


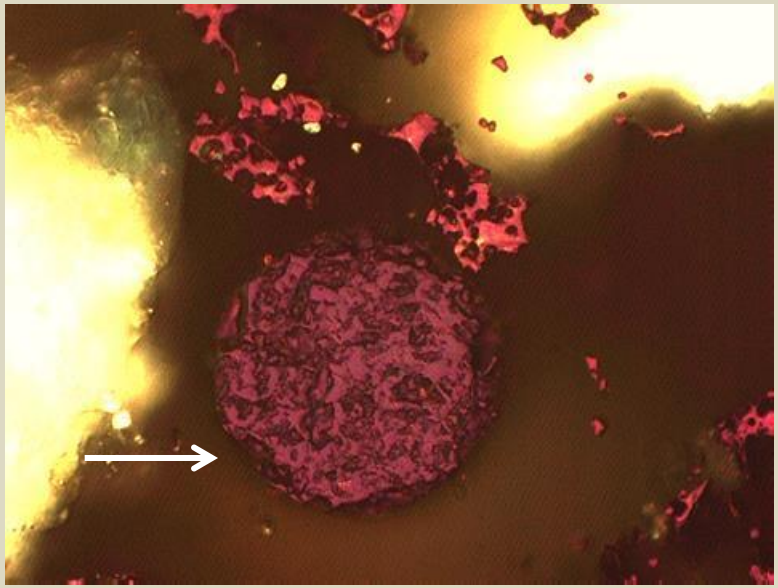
Origin	**Low rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash
COAL BLEND + BIOMASS (sewage sludge + olive pulp)

Inorganics



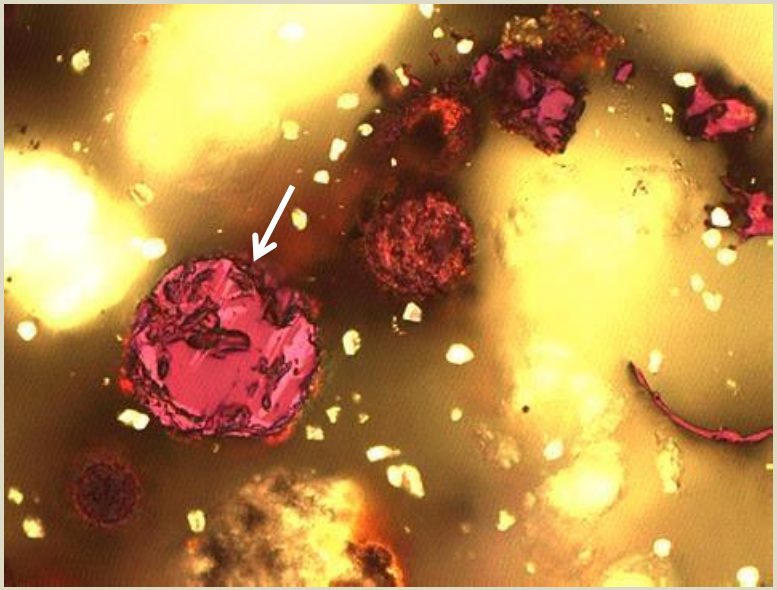


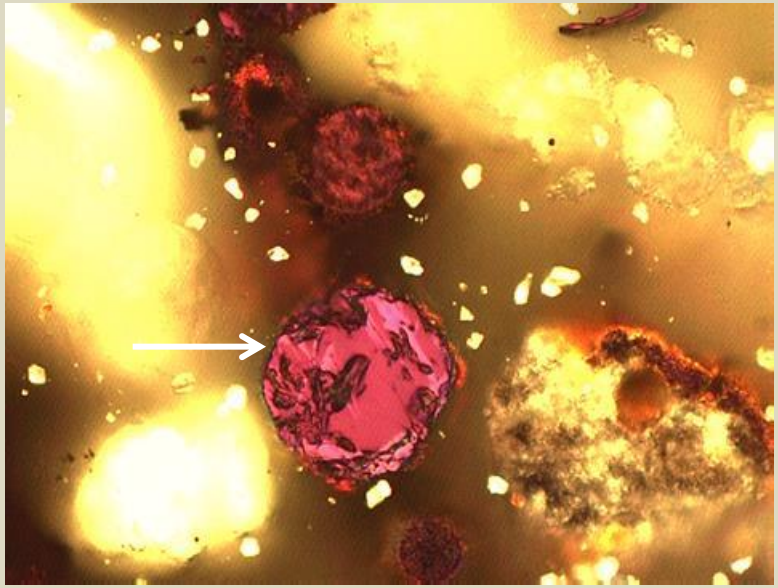
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash
COAL BLEND + BIOMASS (sewage sludge + olive pulp)

Inorganics



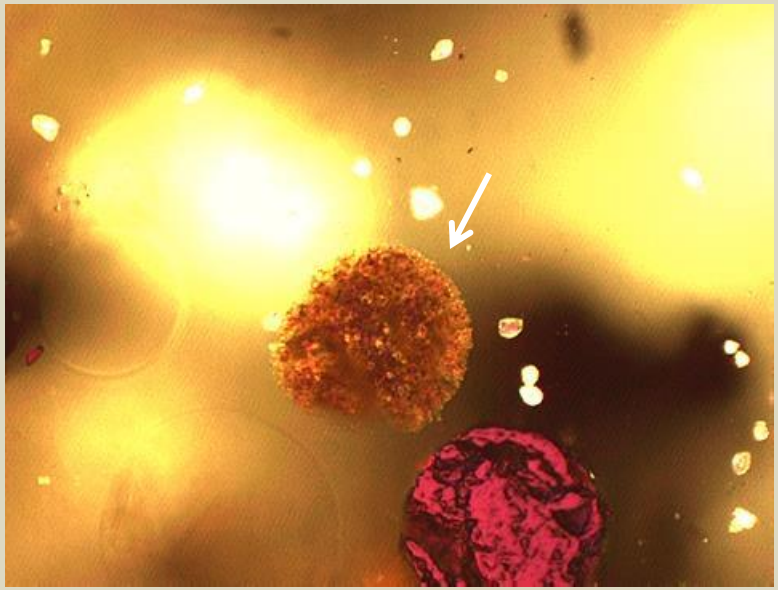


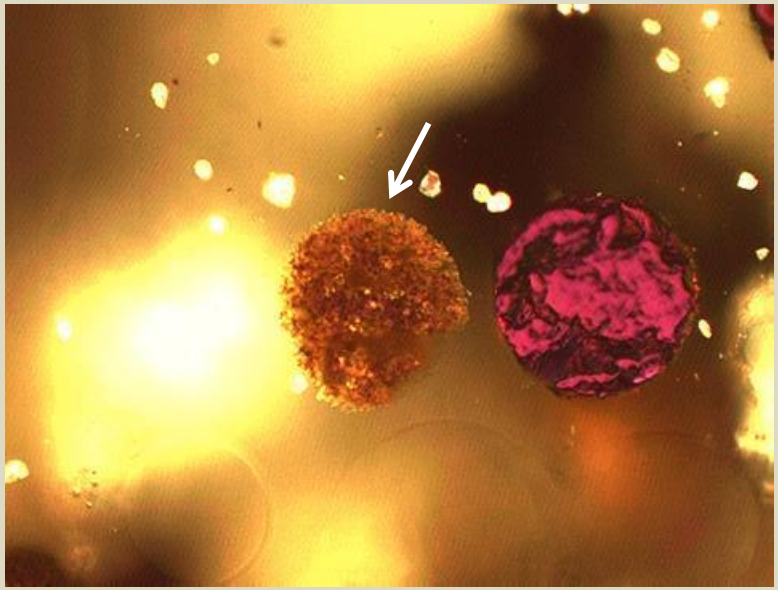
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash
COAL BLEND + BIOMASS (sewage sludge + olive pulp)

Inorganics



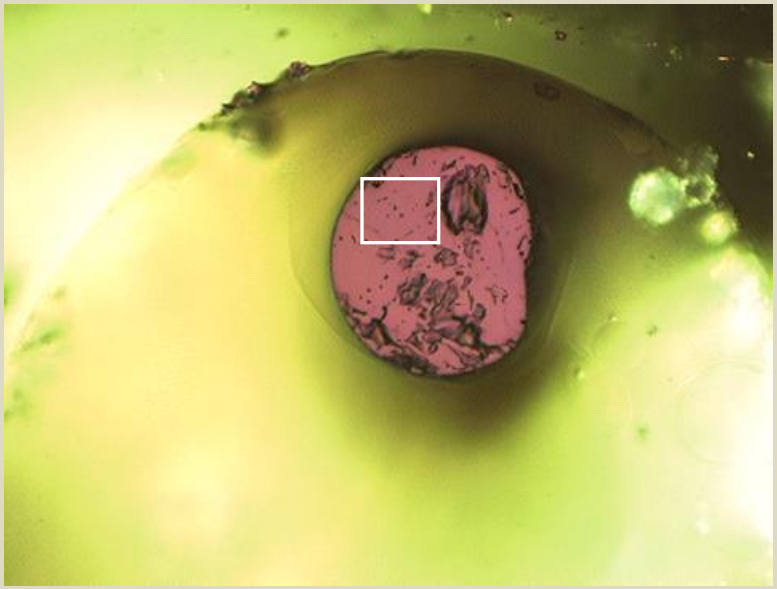


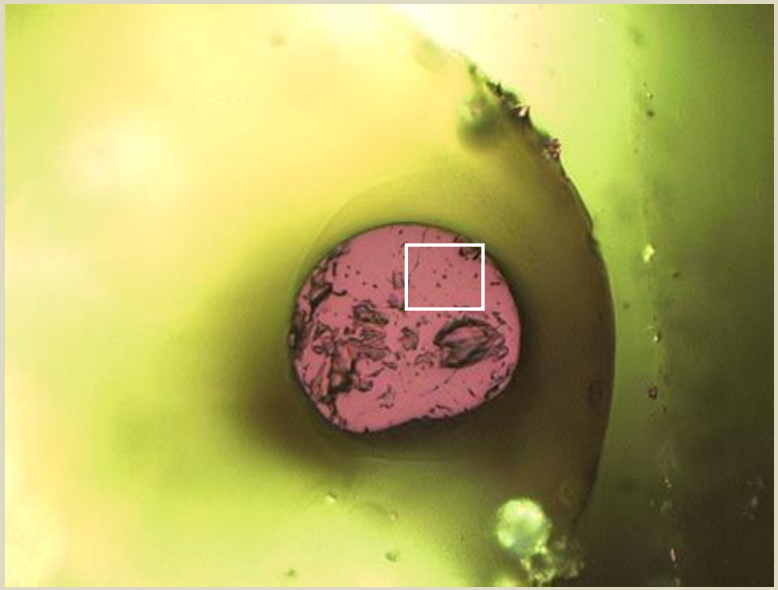
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash
COAL BLEND + BIOMASS (wood pellets + palm pit scales)

Inorganics





Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
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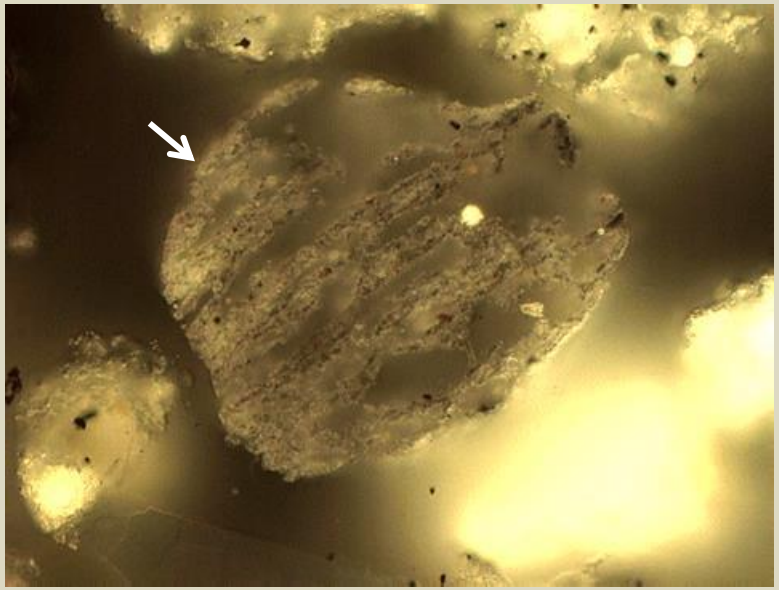
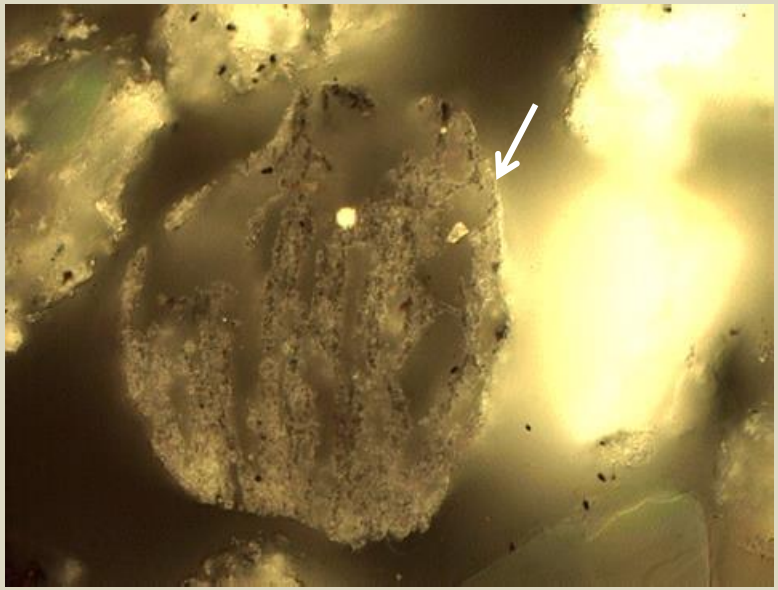
Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash
COAL BLEND + BIOMASS (wood pellets + palm pit scales)

Inorganics





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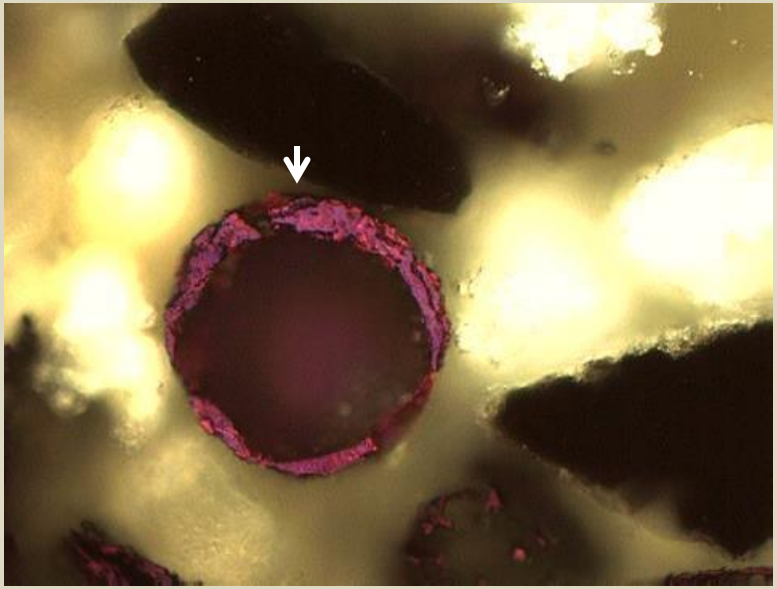
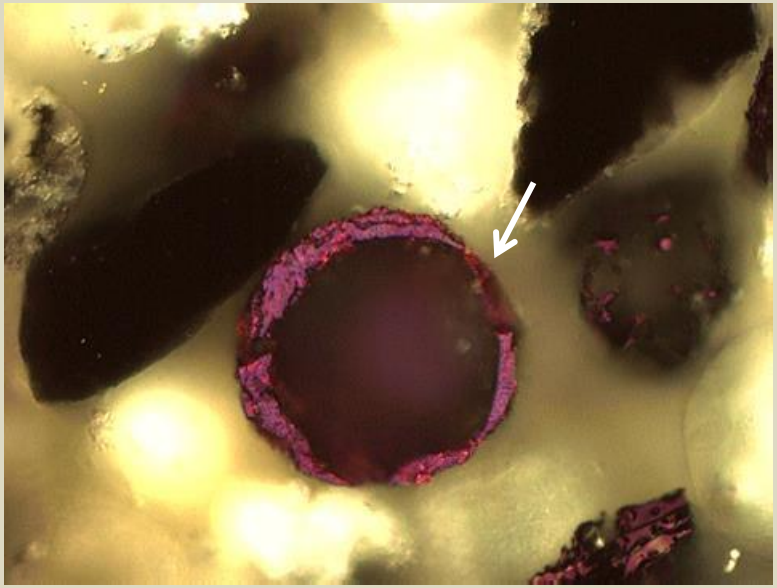
Pulverized Coal Combustion Fly Ash
COAL BLEND + BIOMASS (wood pellets + palm pit scales)

Inorganics



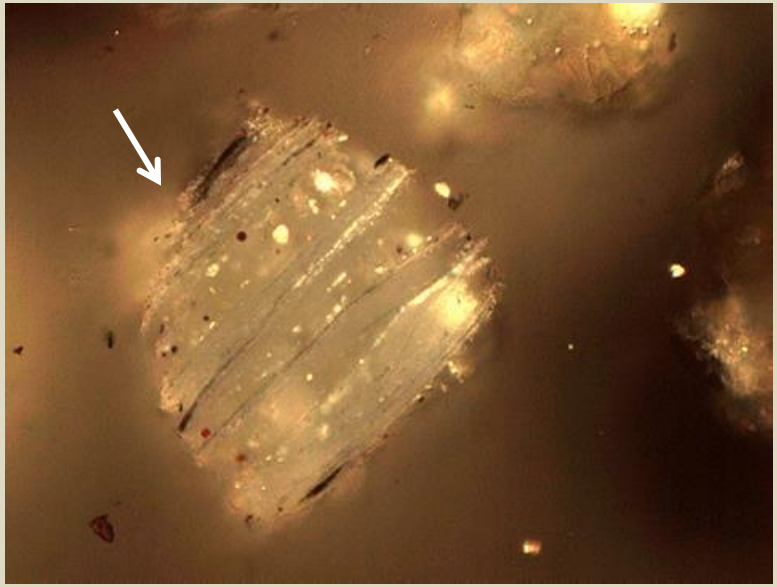


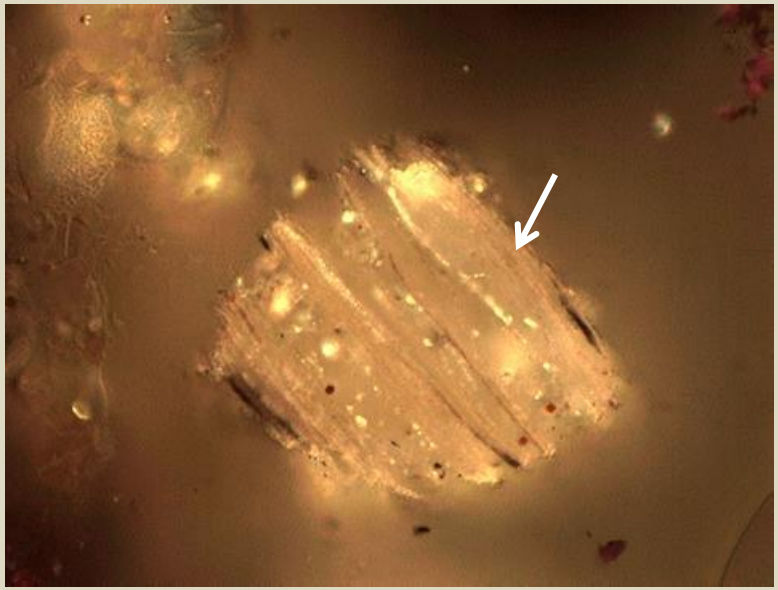
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Pulverized Coal Combustion Fly Ash
COAL BLEND + BIOMASS (sewage sludge + olive stone/olive pulp)

Inorganics



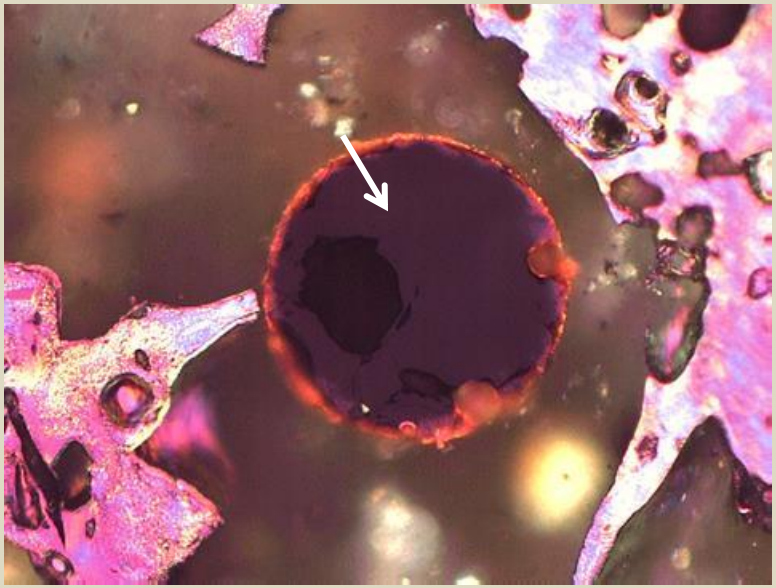


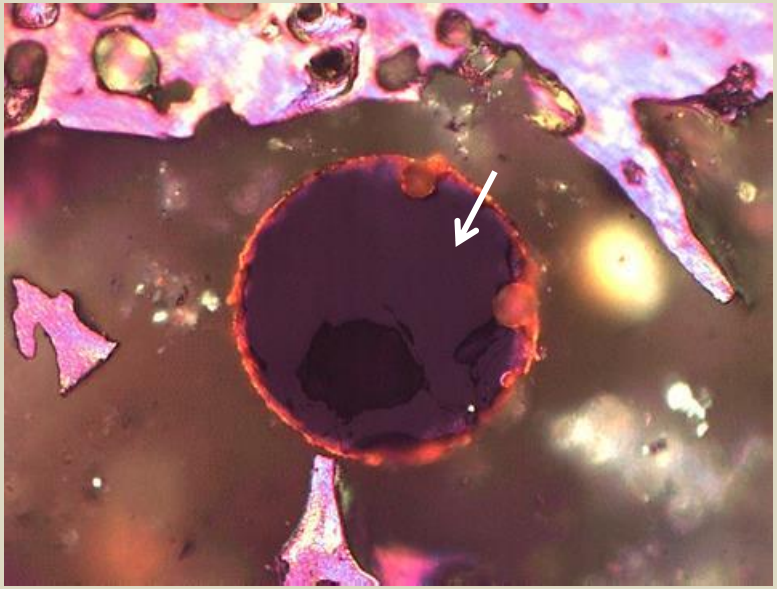
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash

Inorganics



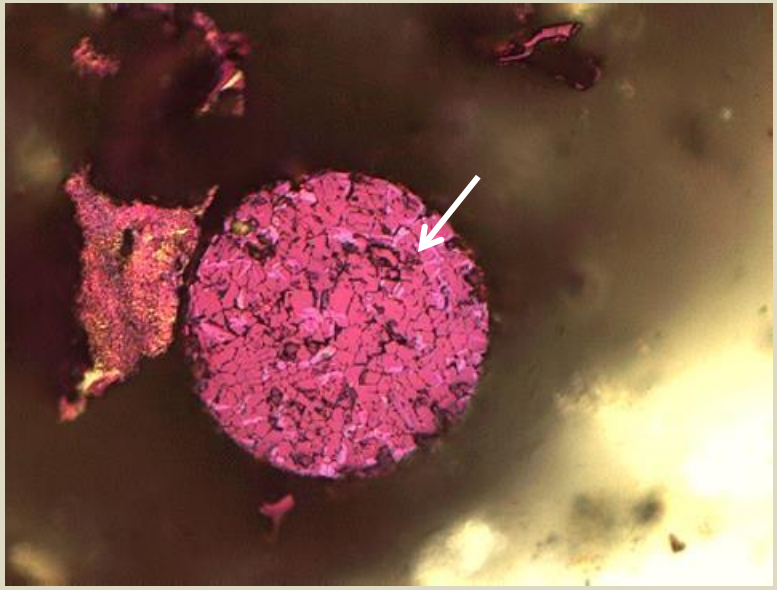


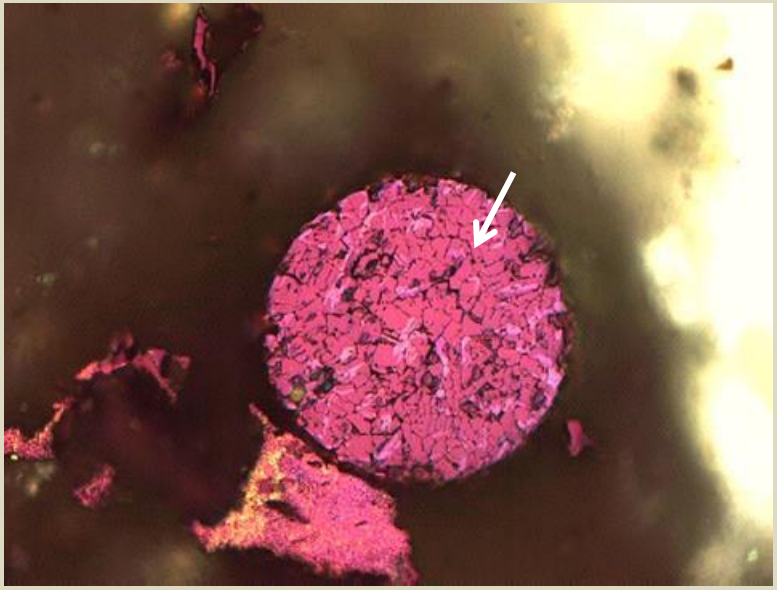
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash

Inorganics



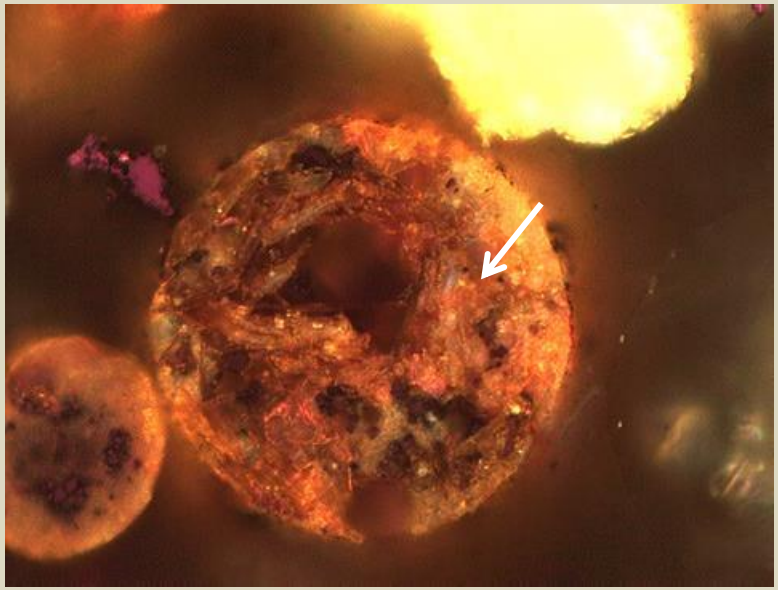


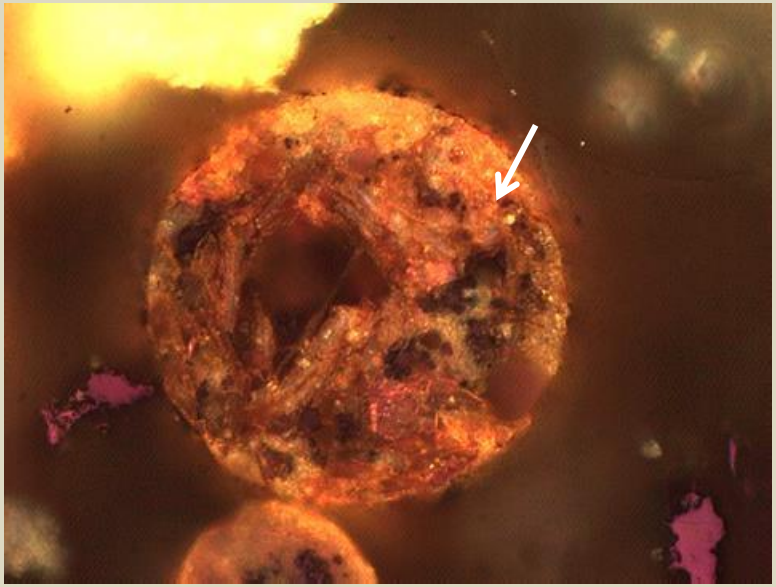
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash

Inorganics



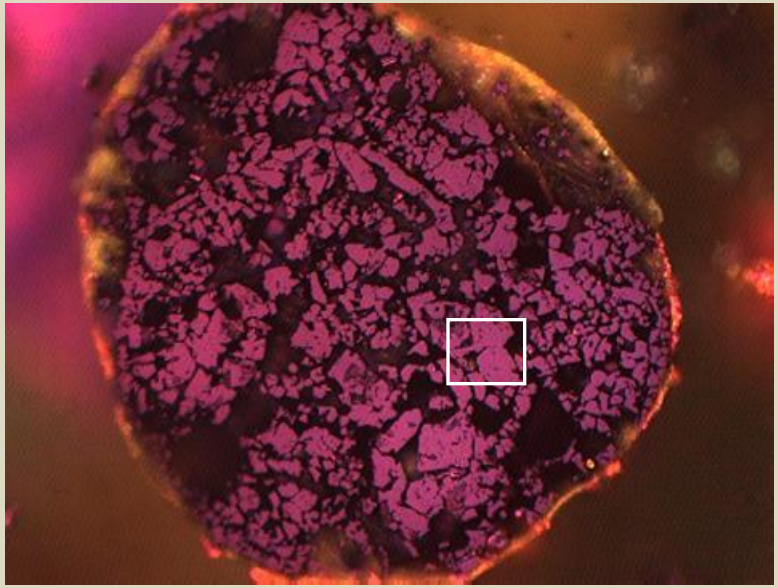


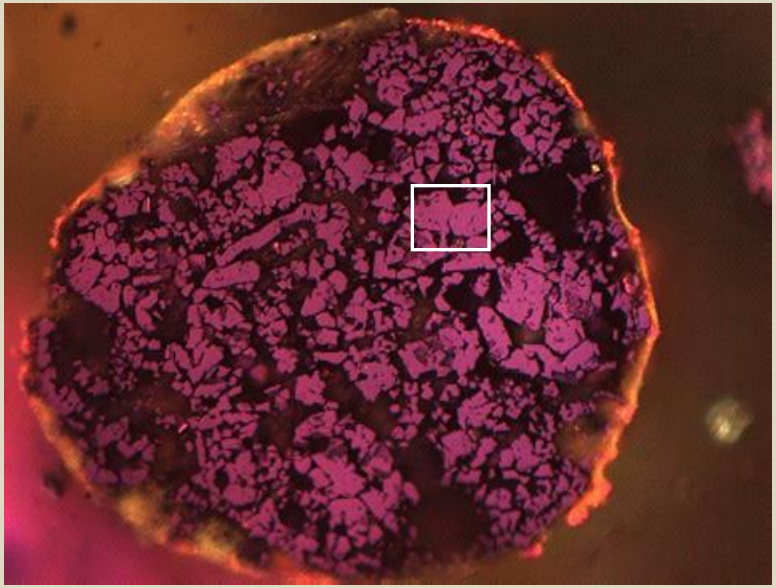
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash

Inorganics



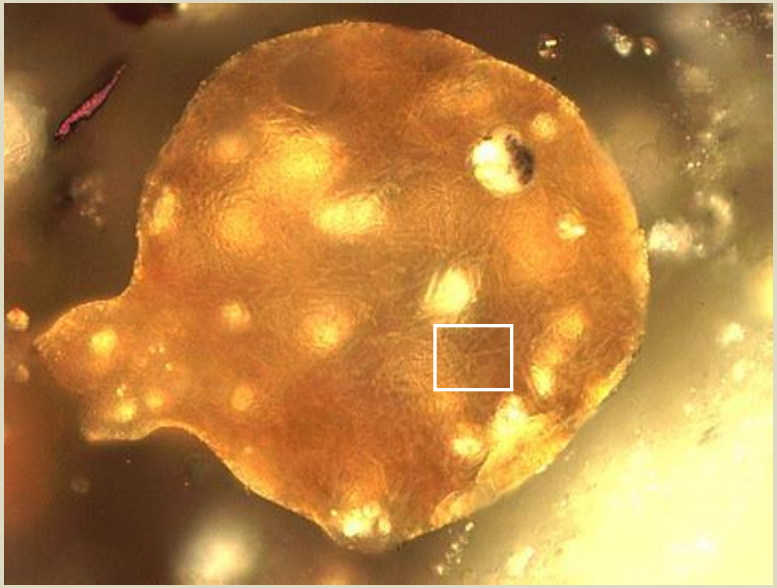


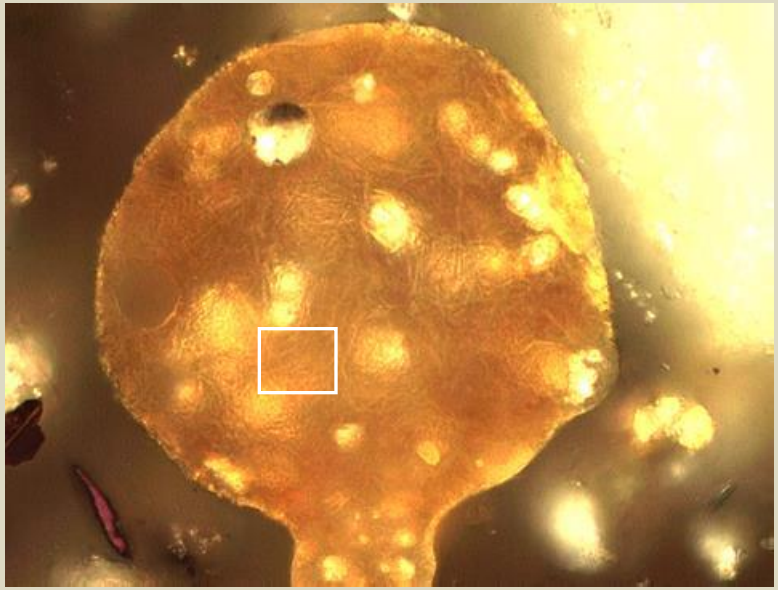
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash

Inorganics



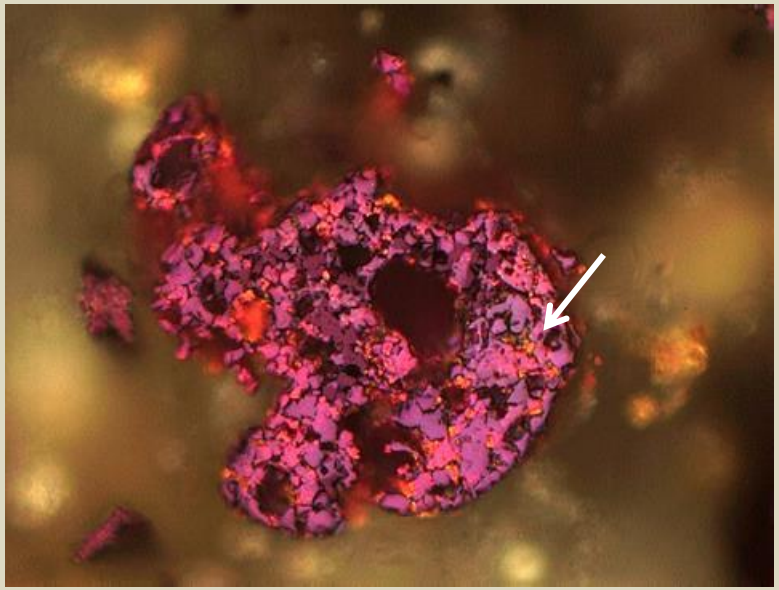


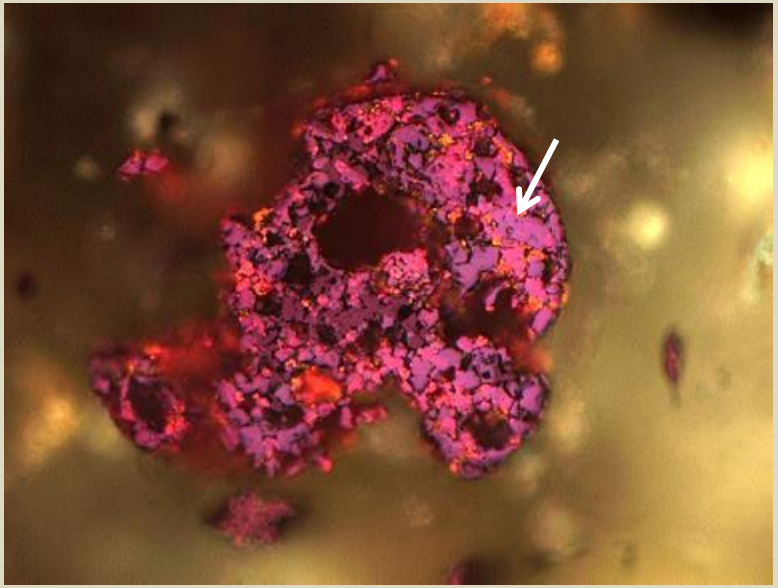
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash

Inorganics



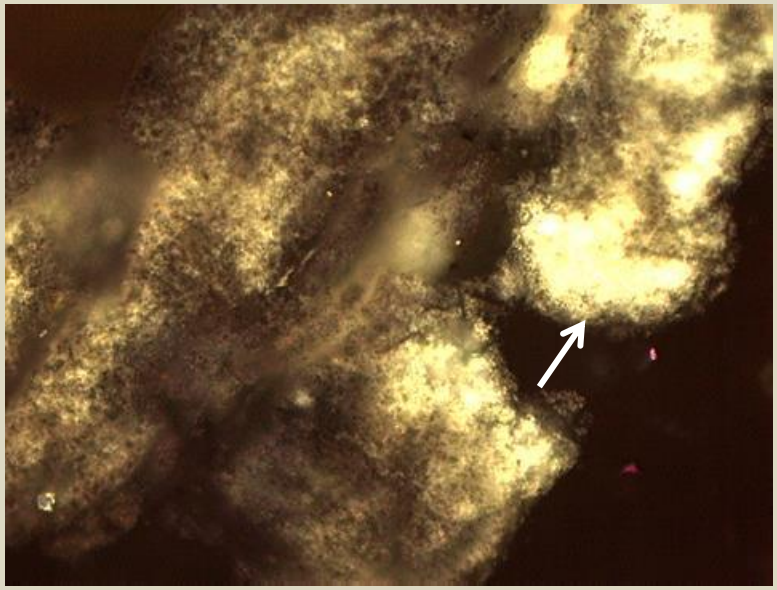


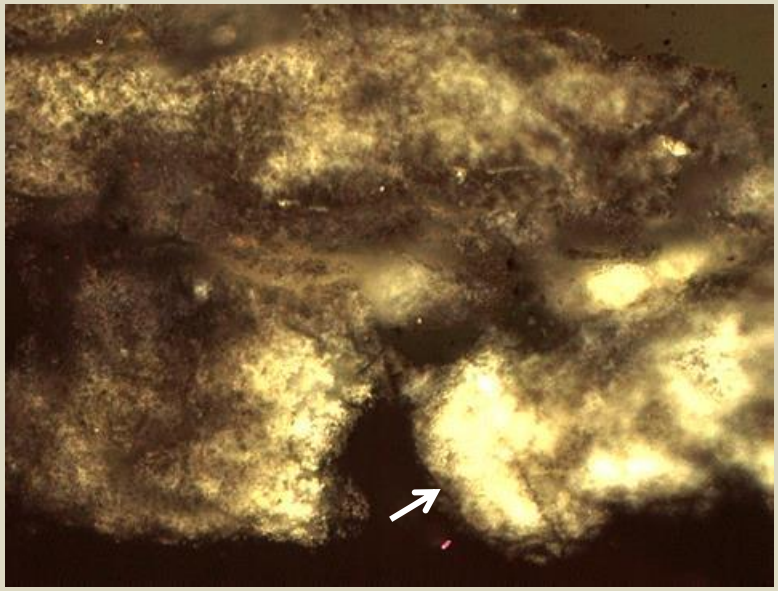
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash

Inorganics



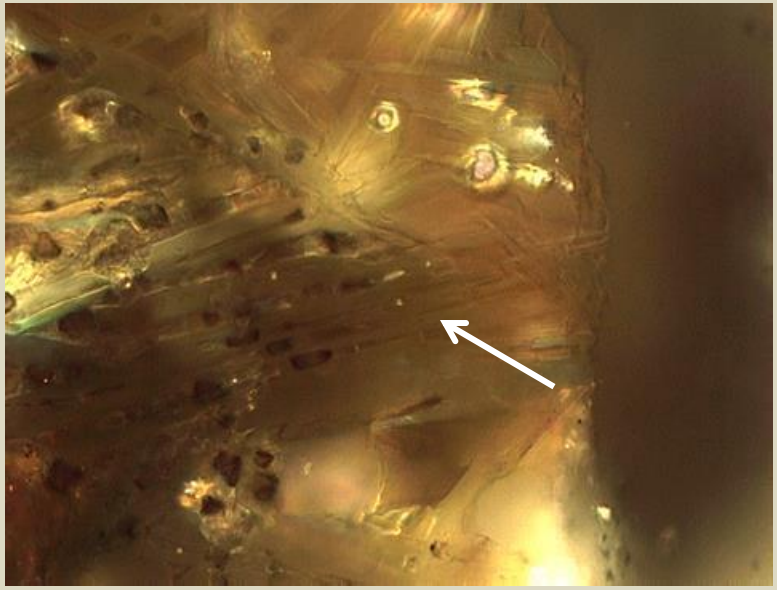


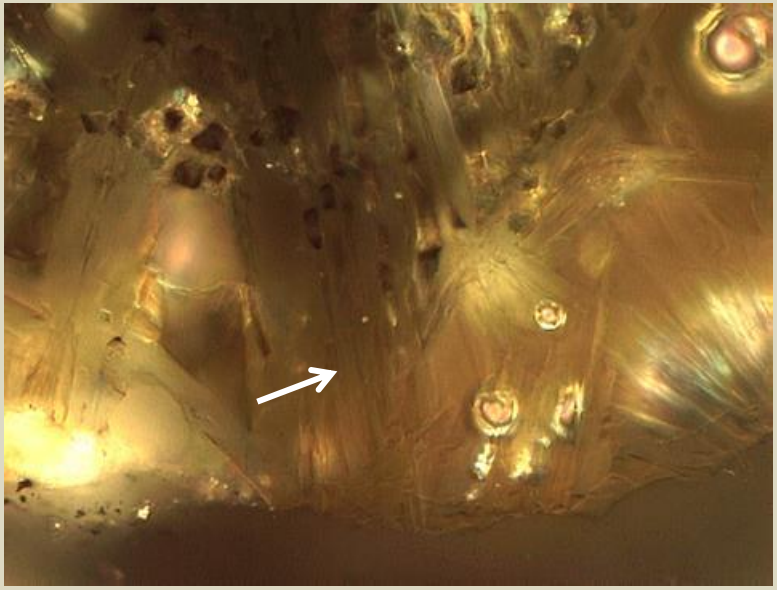
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash

Inorganics



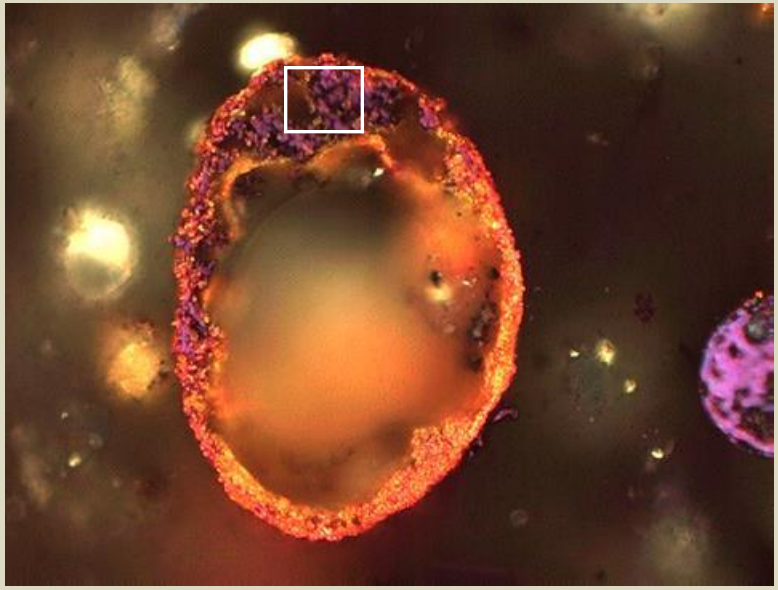


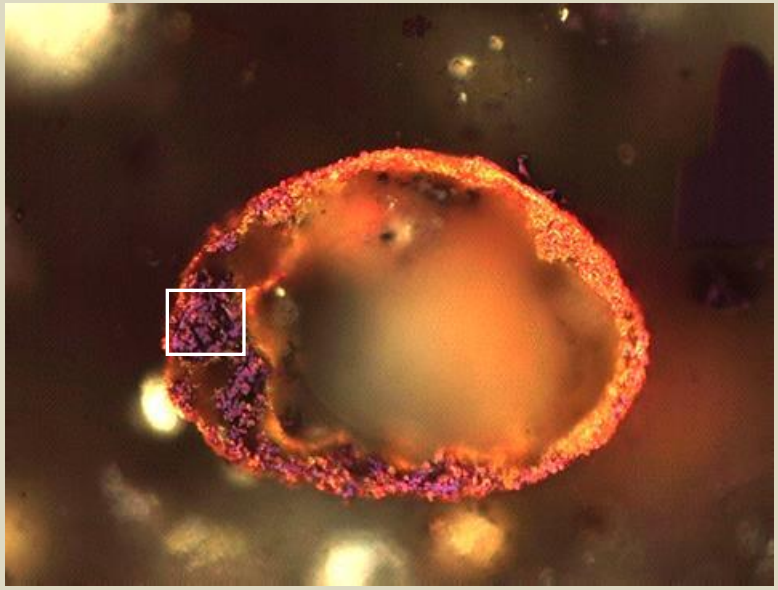
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash

Inorganics



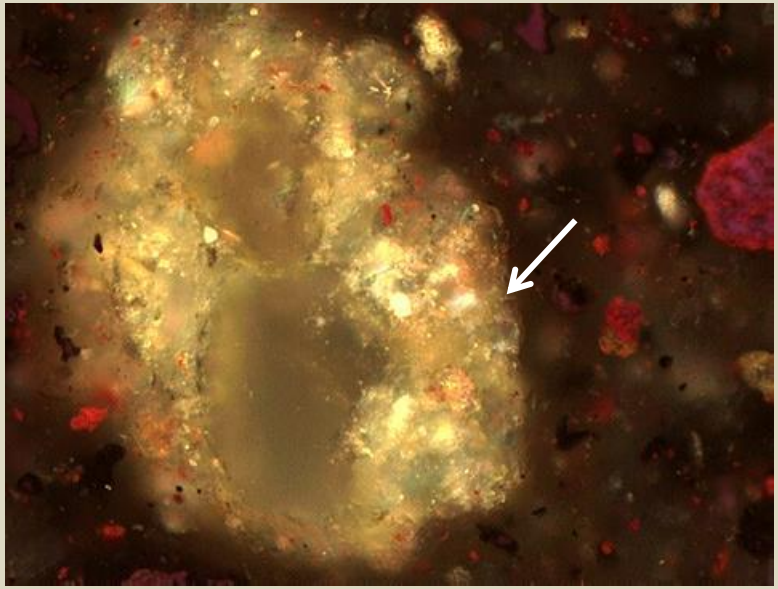


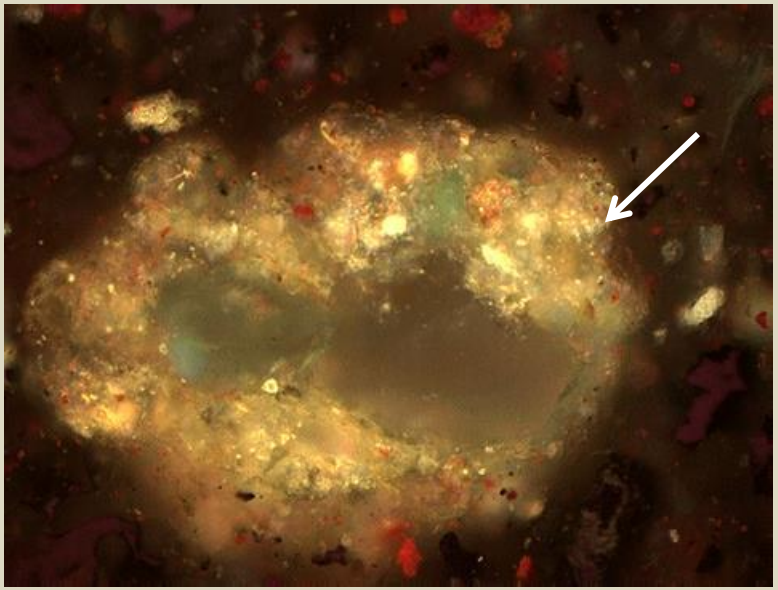
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics



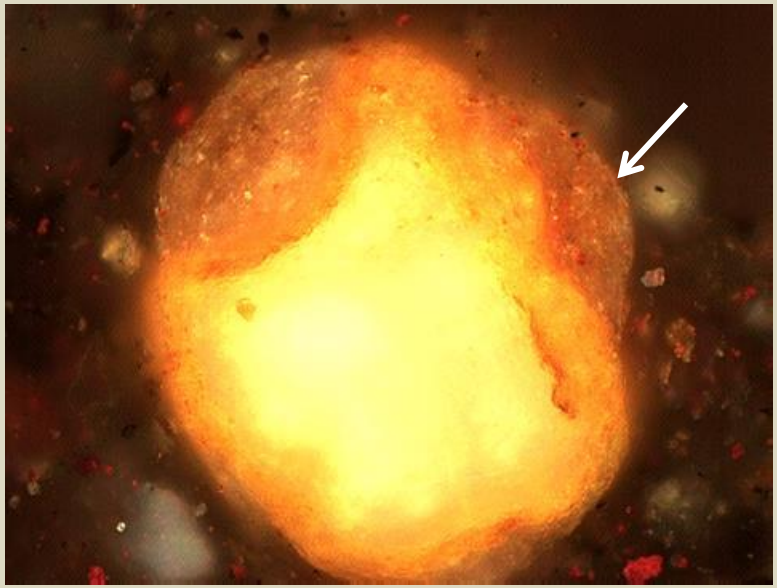


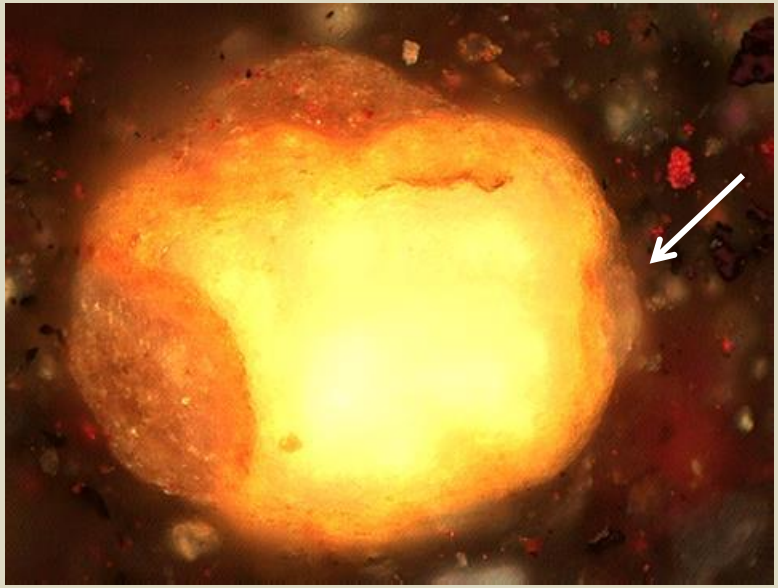
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics



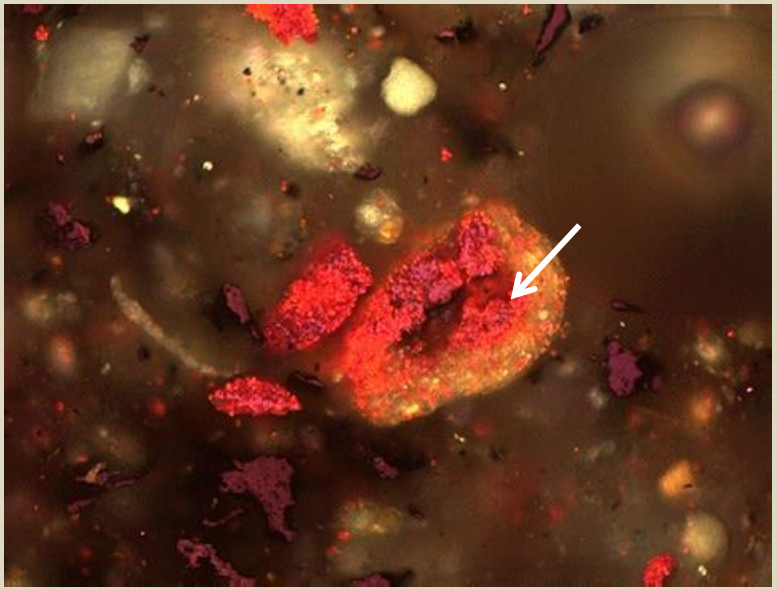


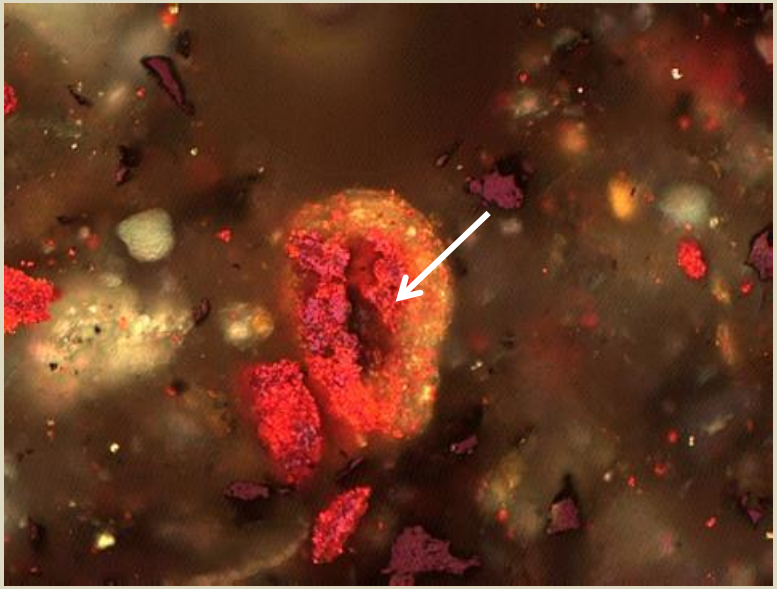
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics



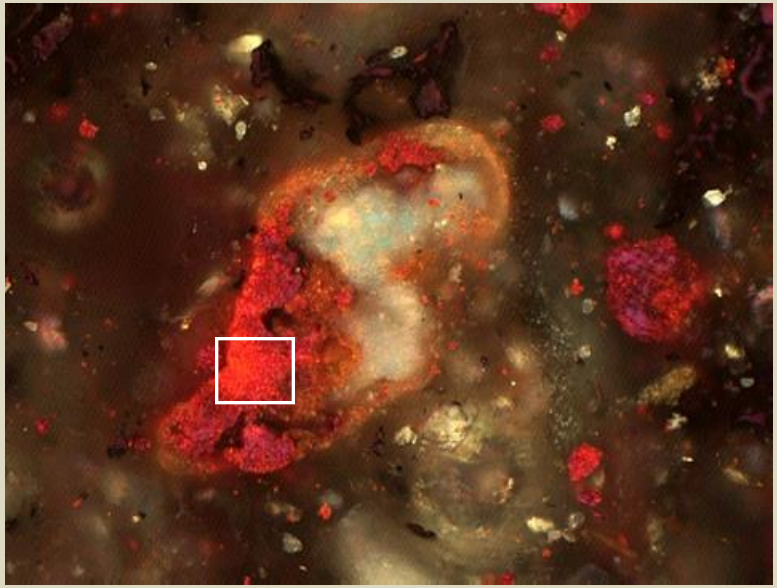


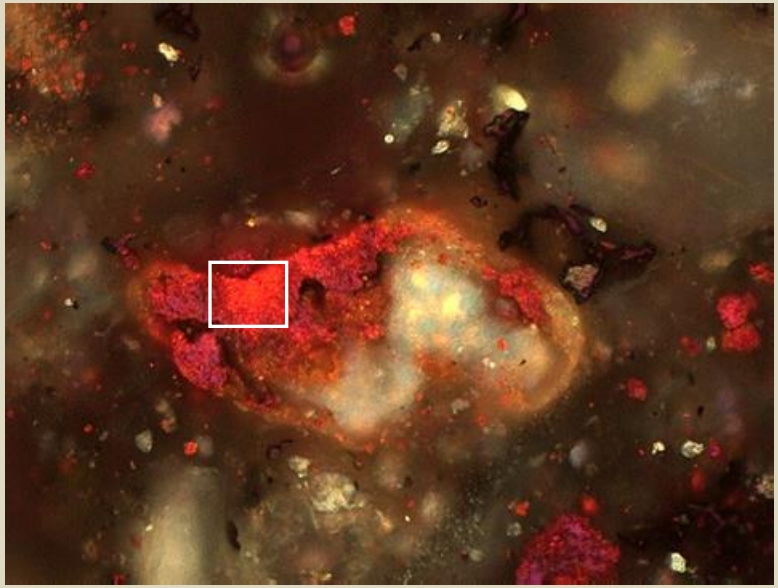
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics



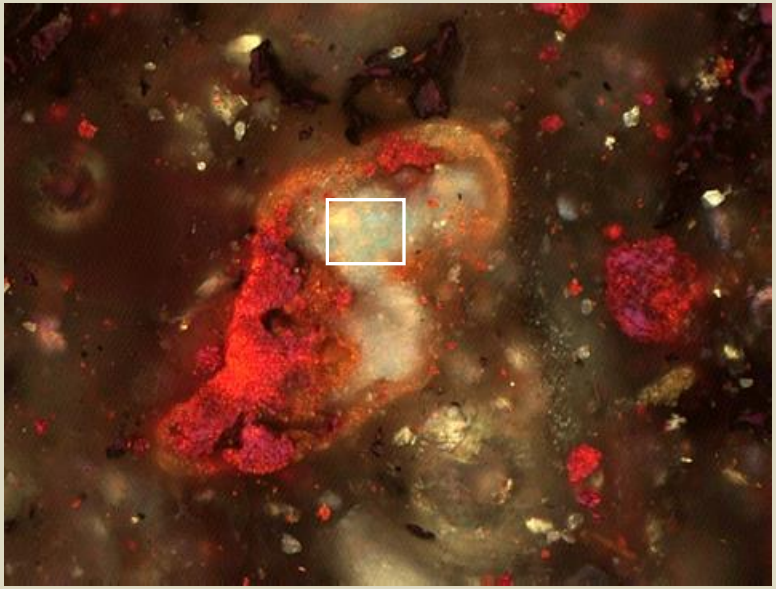


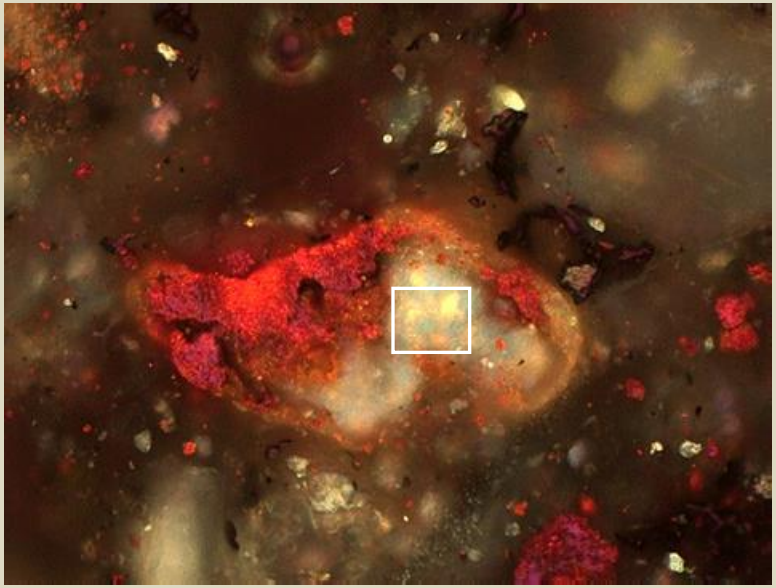
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics



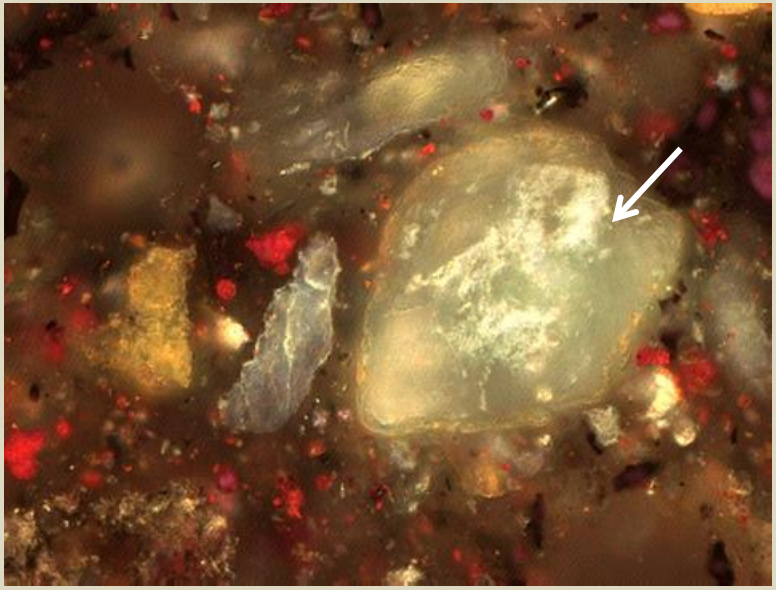


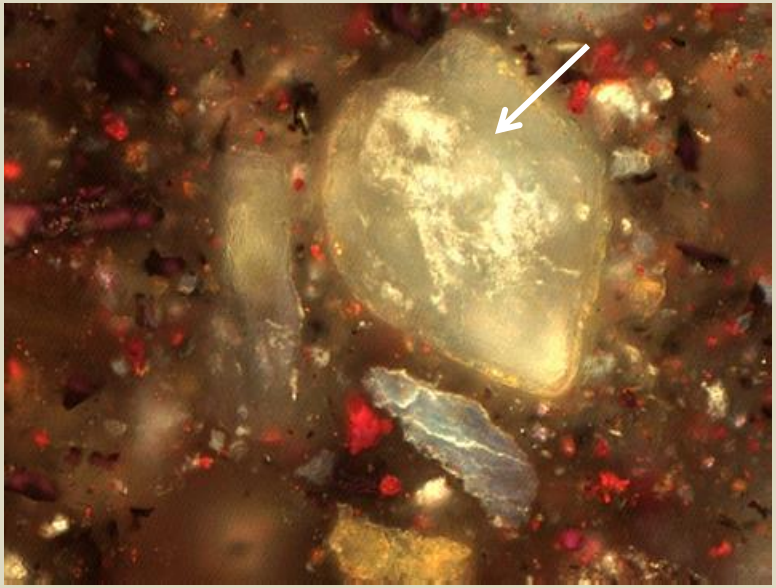
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics



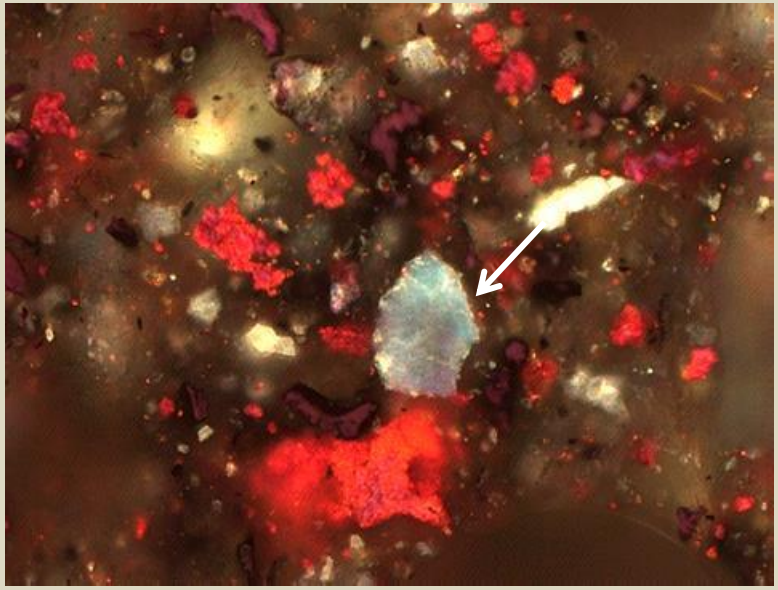


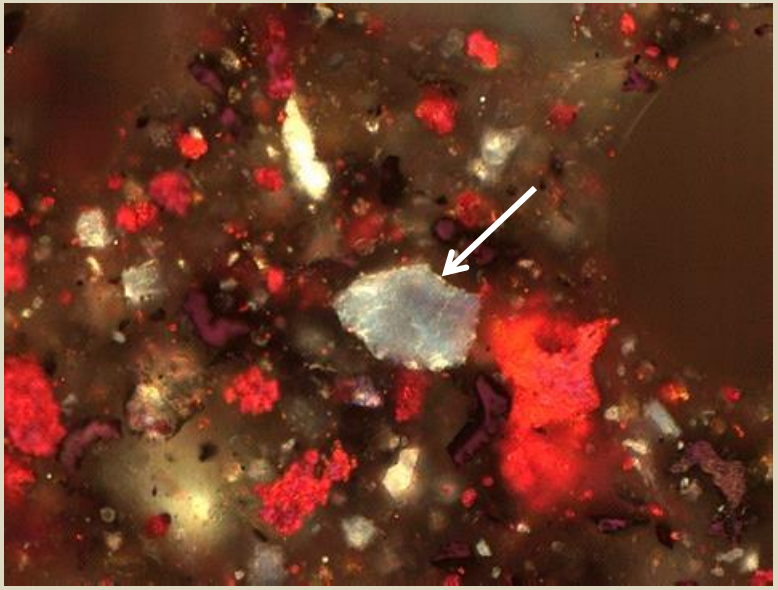
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics



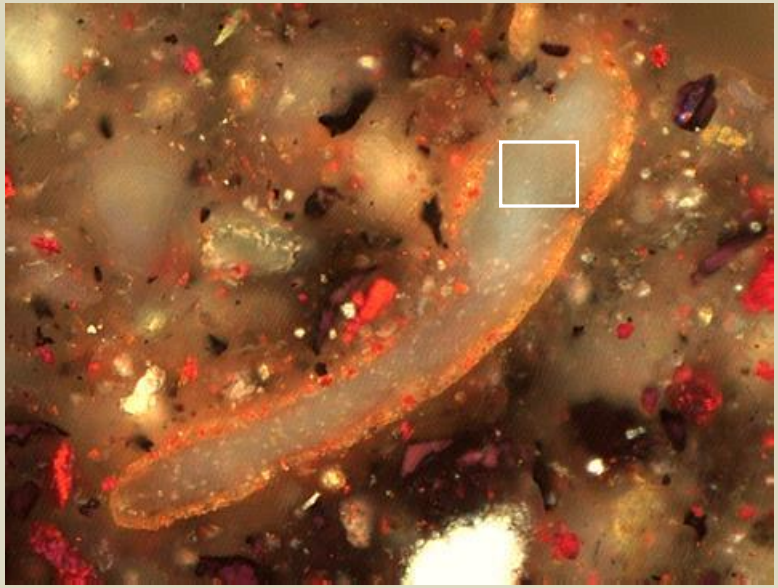


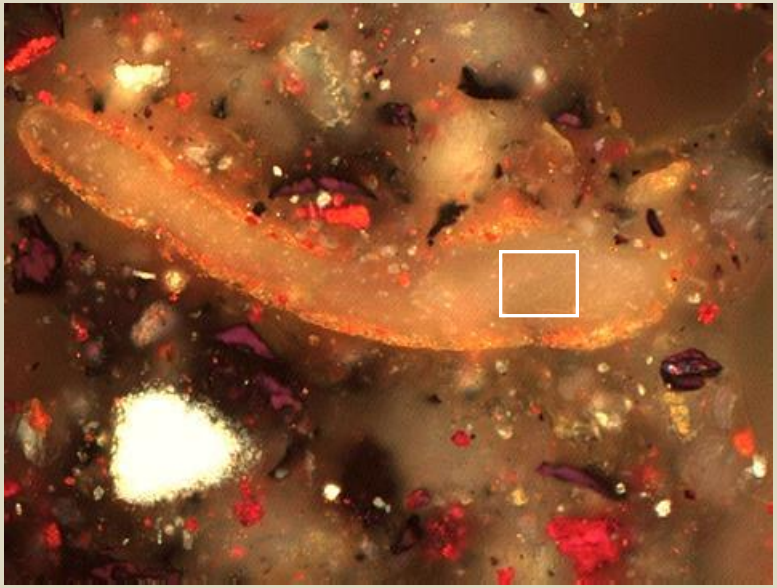
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics



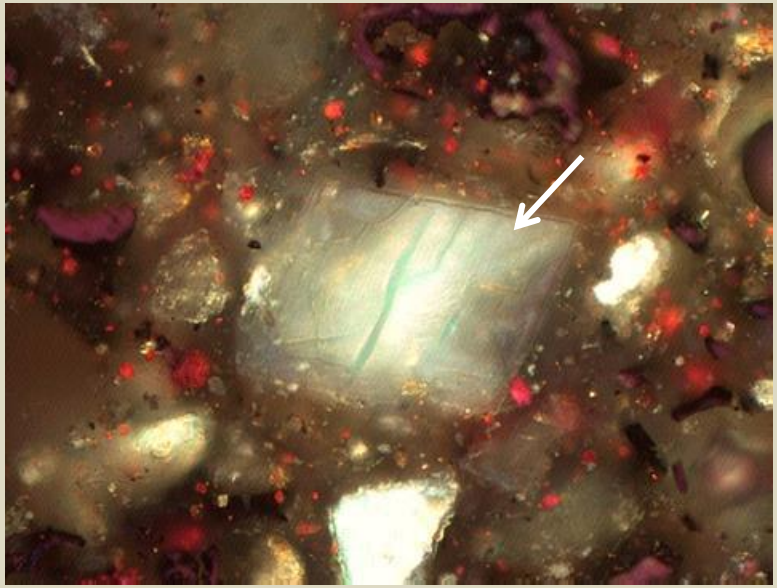


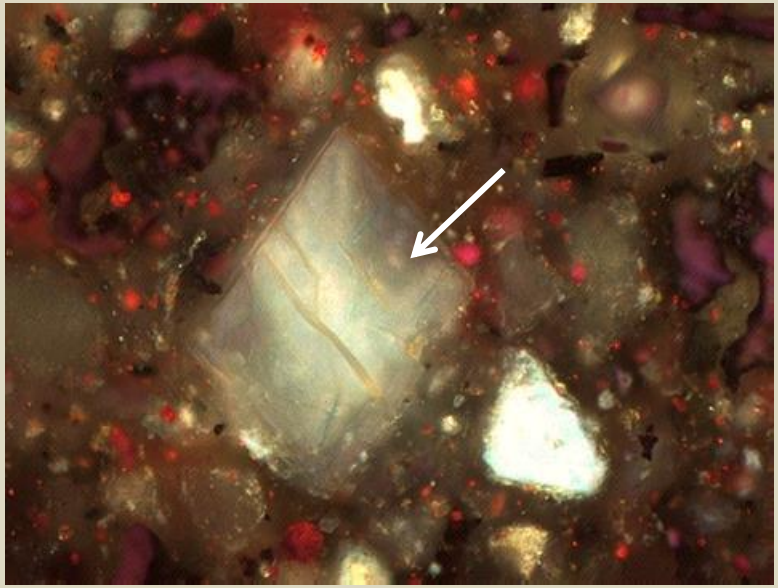
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics



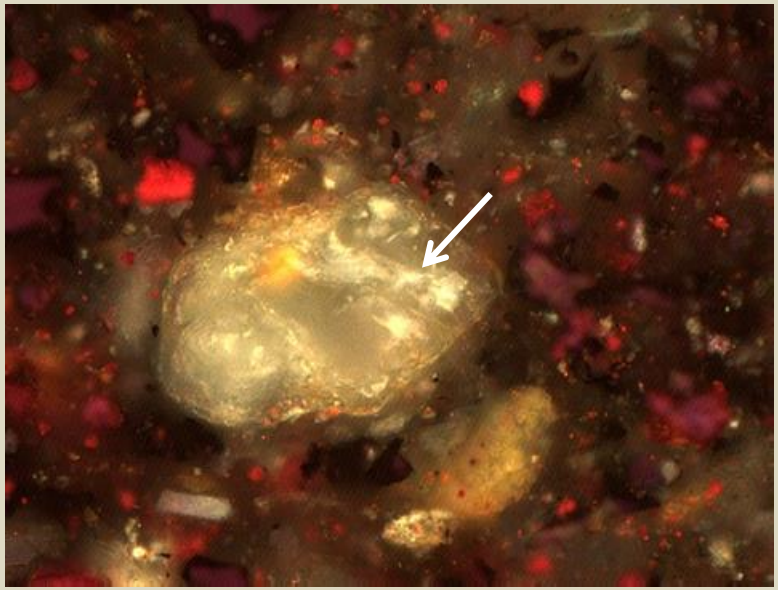


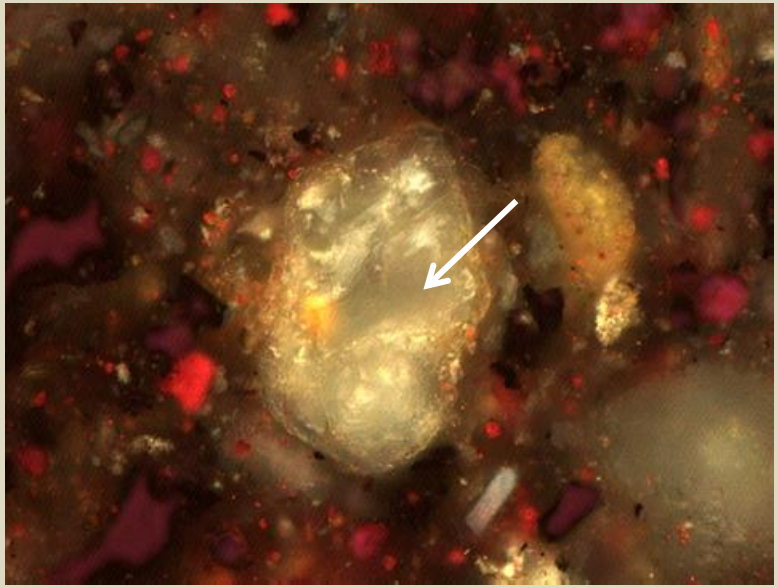
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics



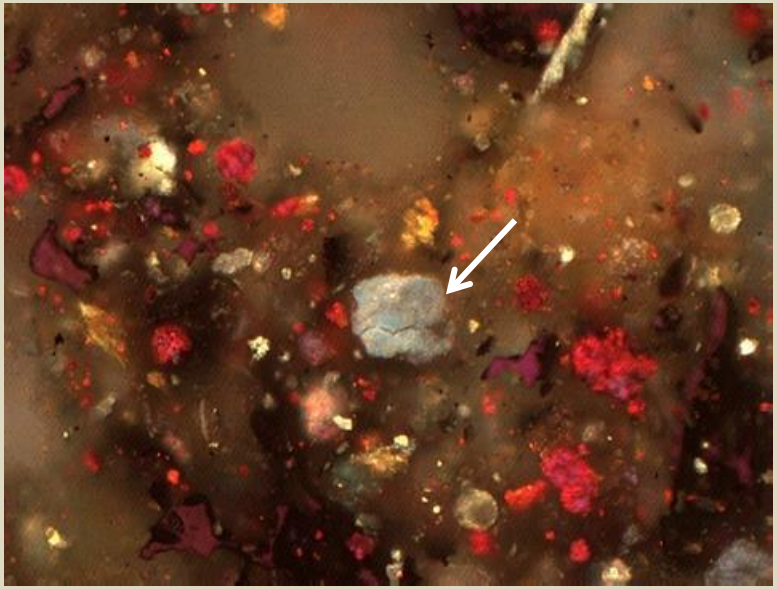


Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics

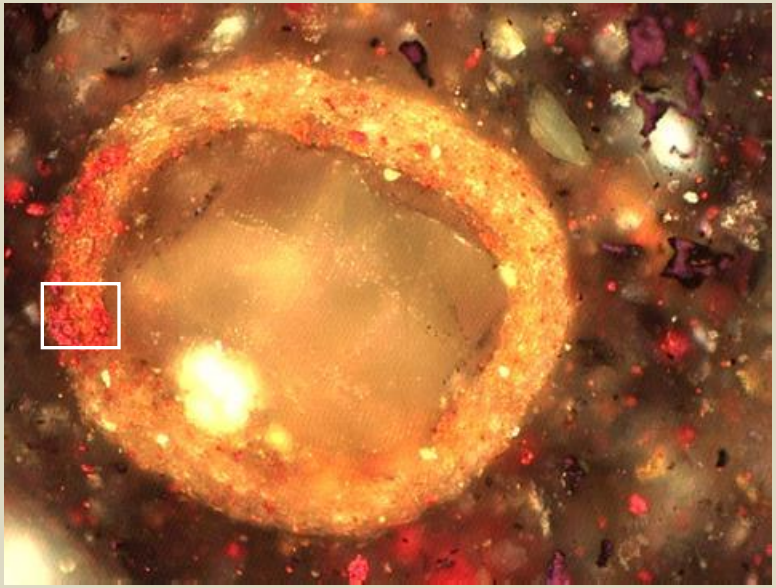


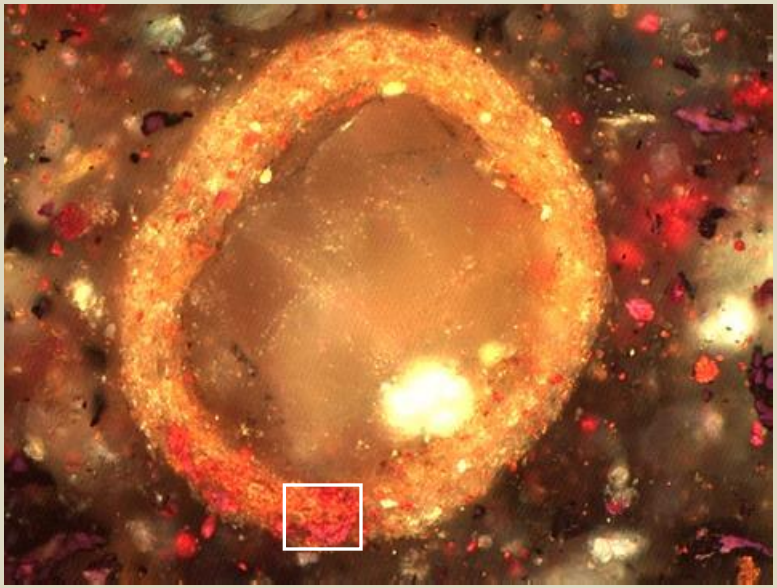
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics



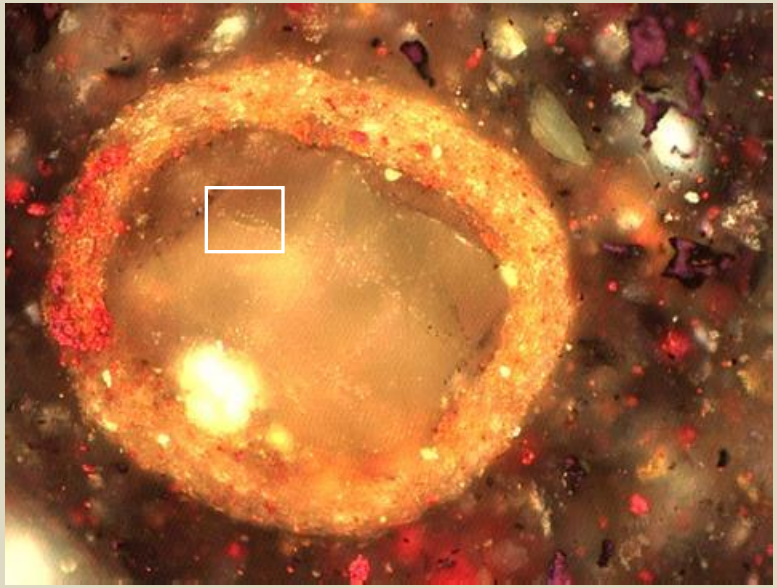


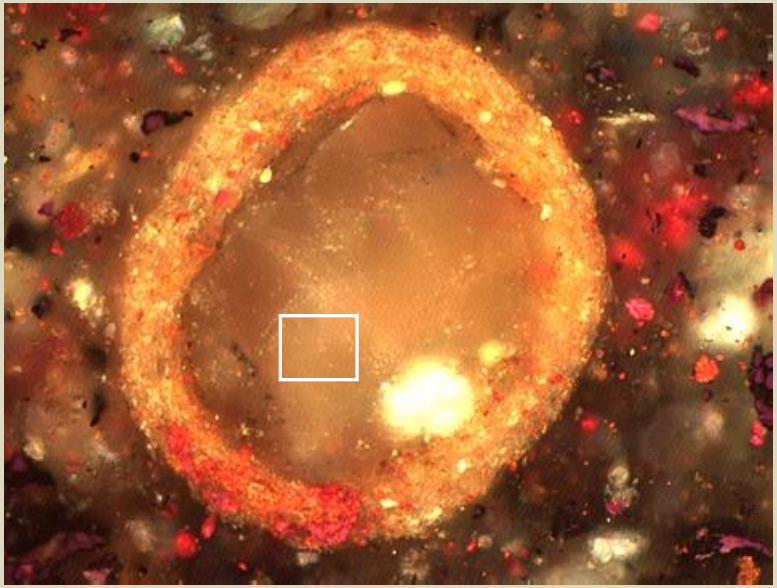
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics



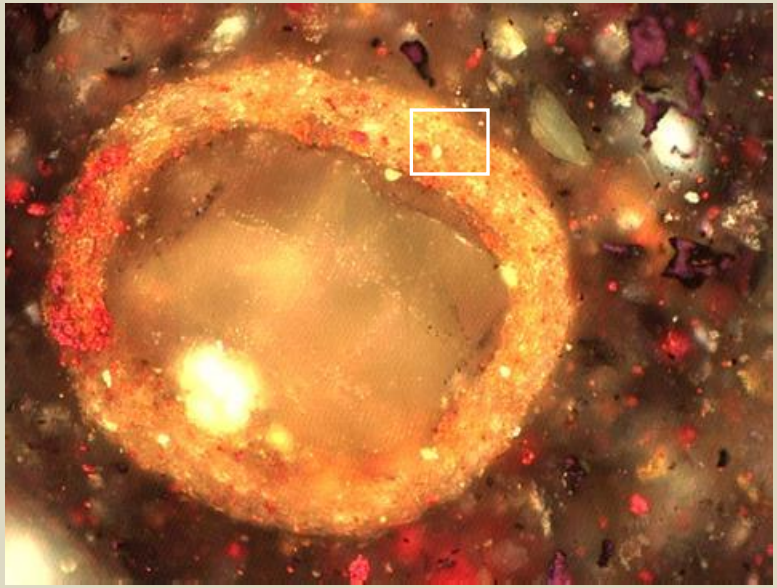


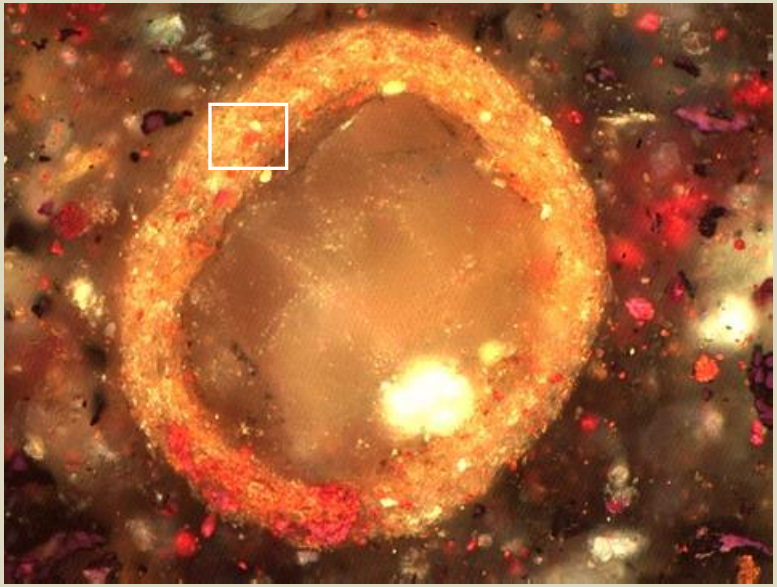
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics





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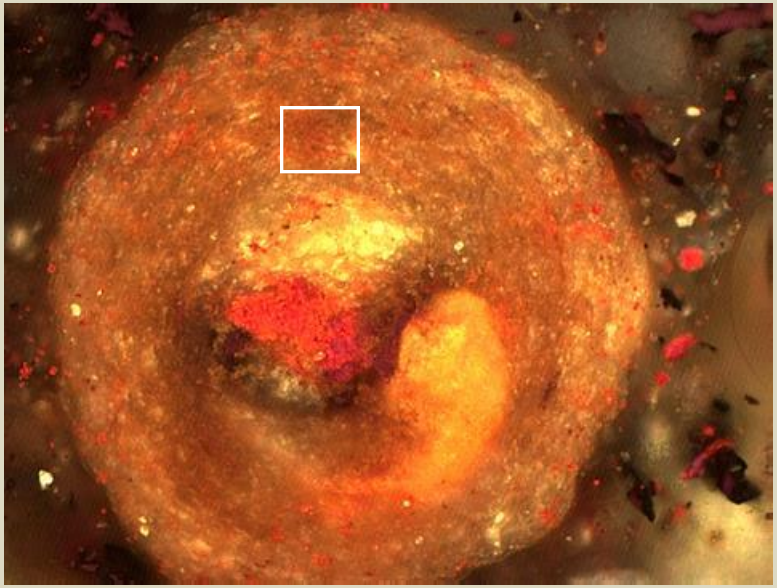
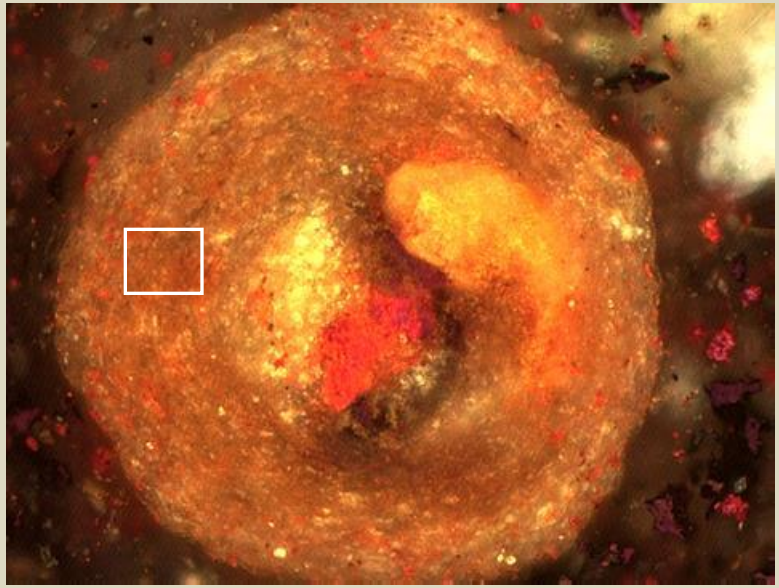
Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics





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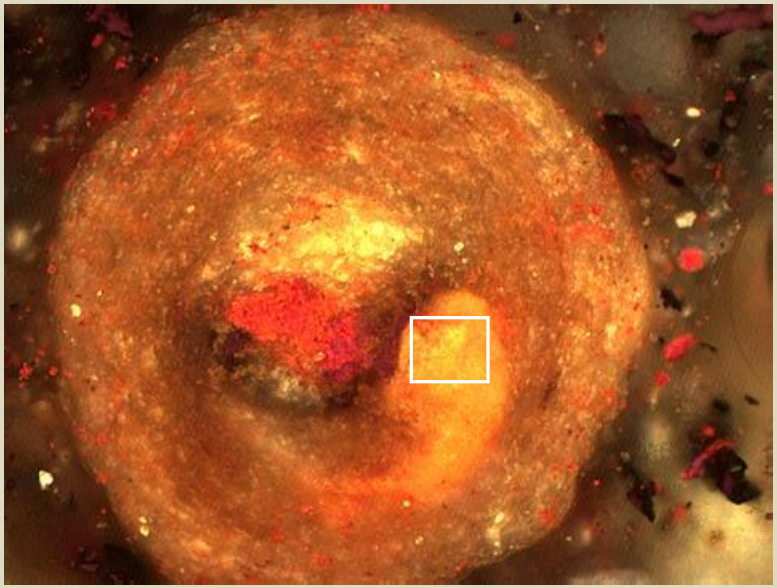
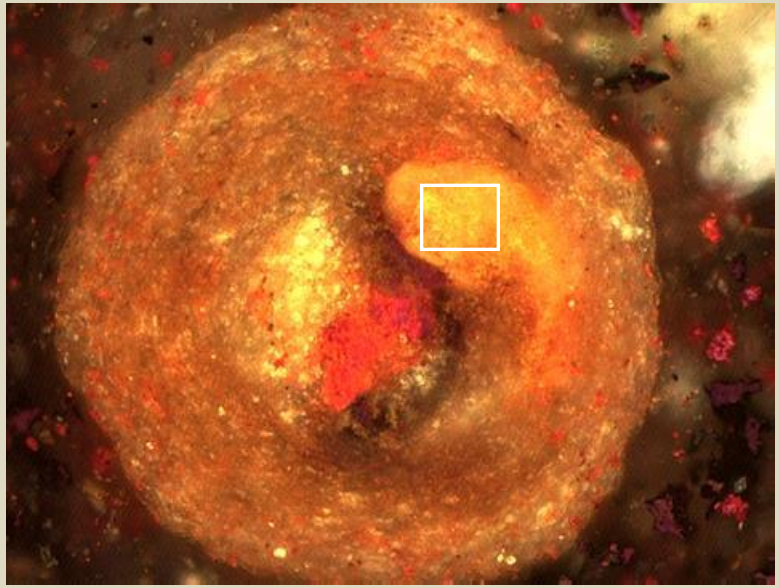
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics





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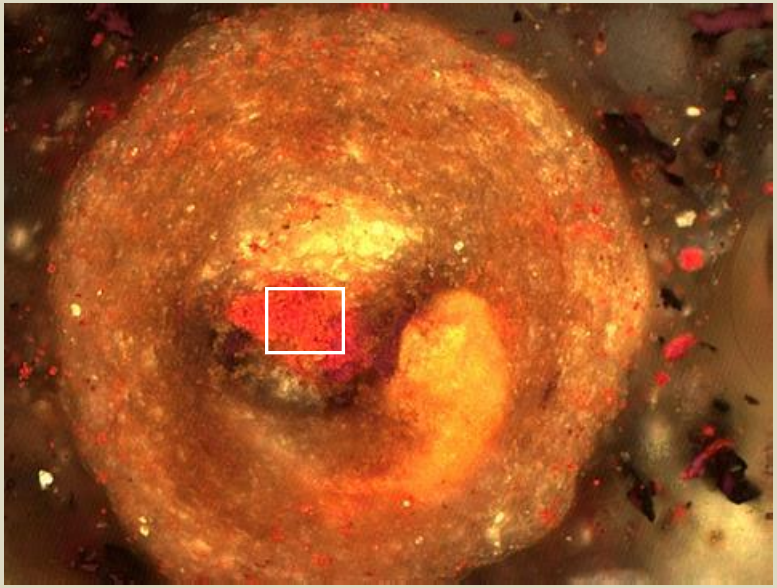
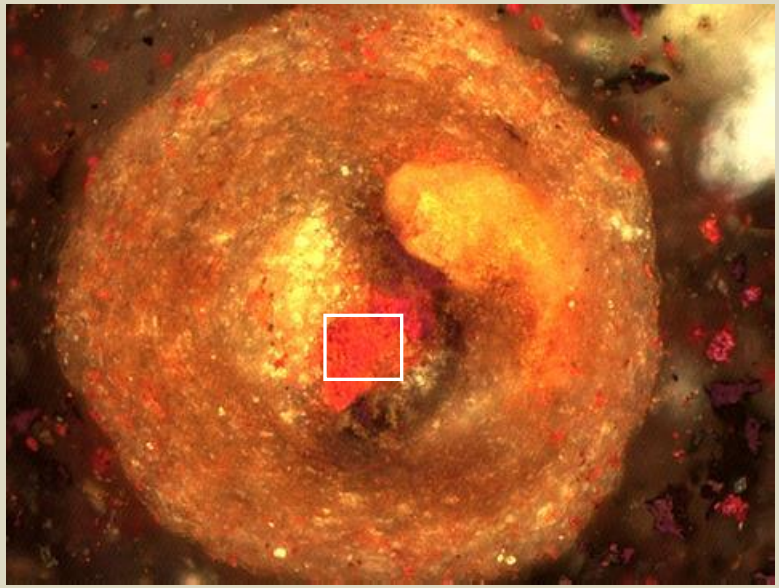
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics



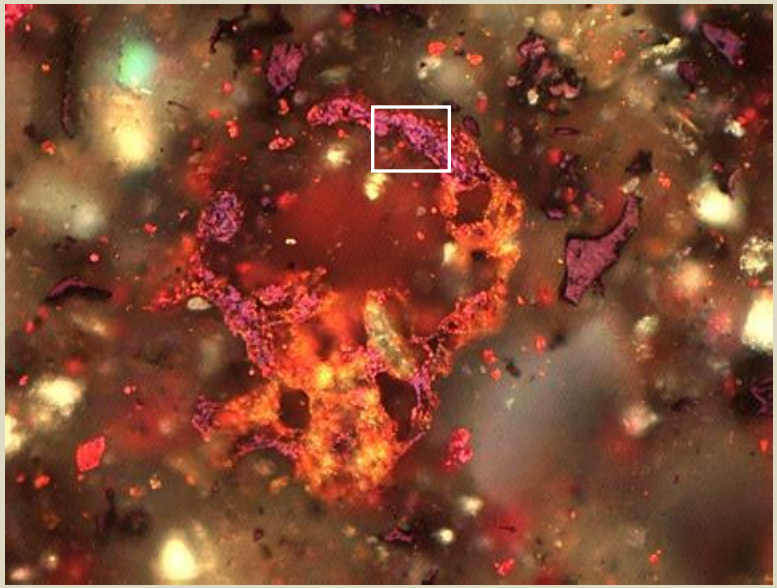


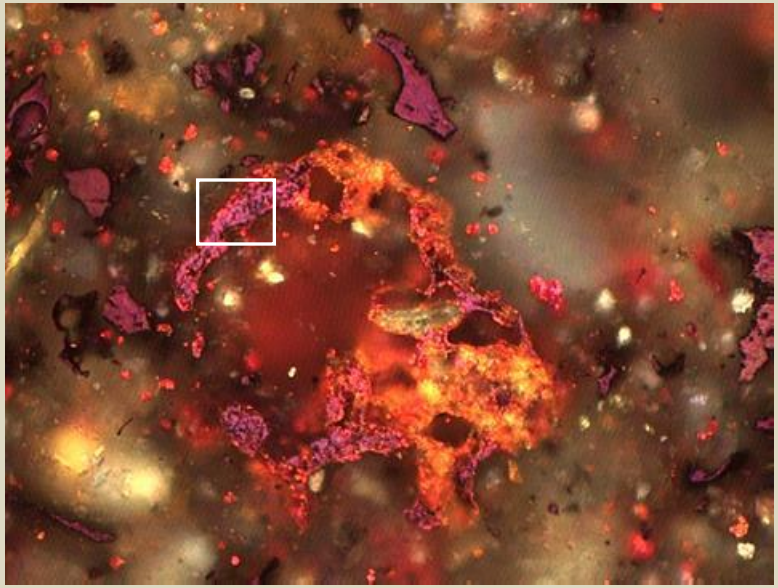
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics



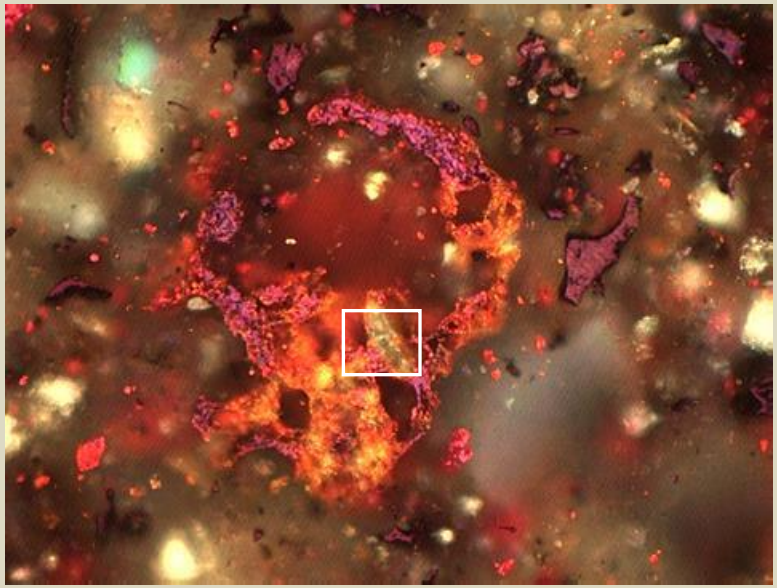


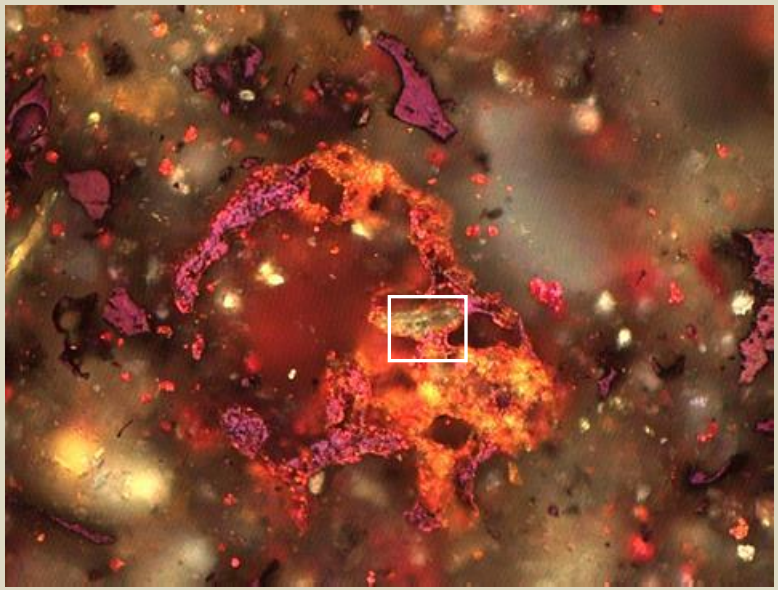
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics



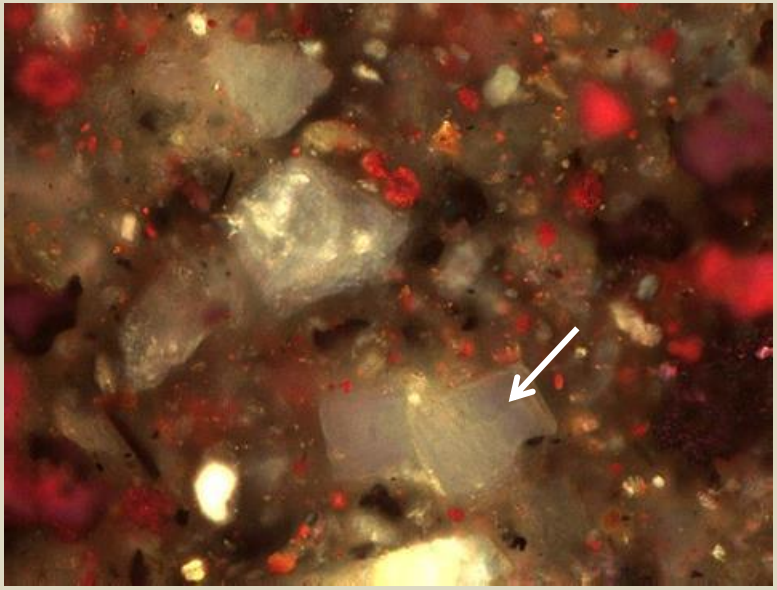


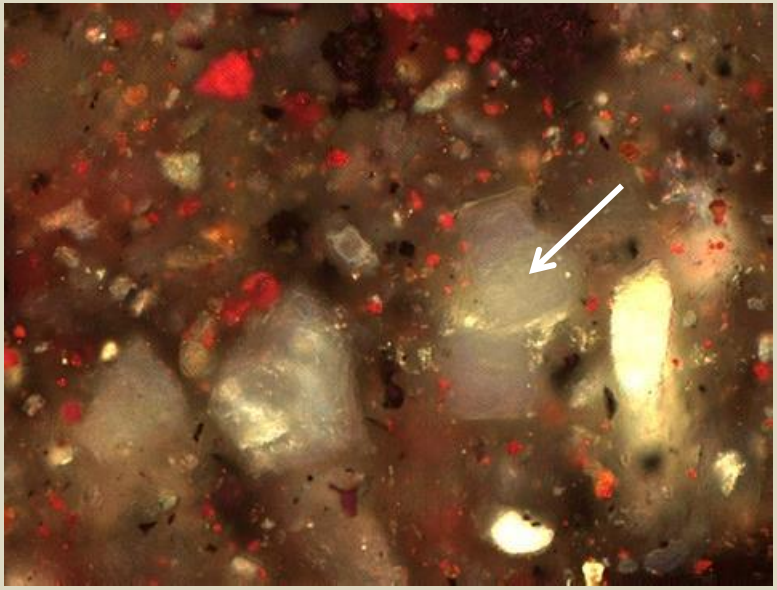
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics





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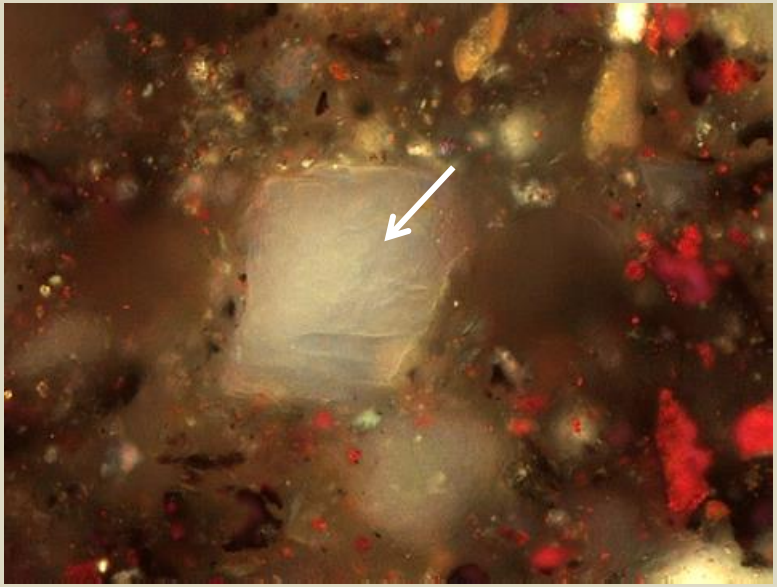
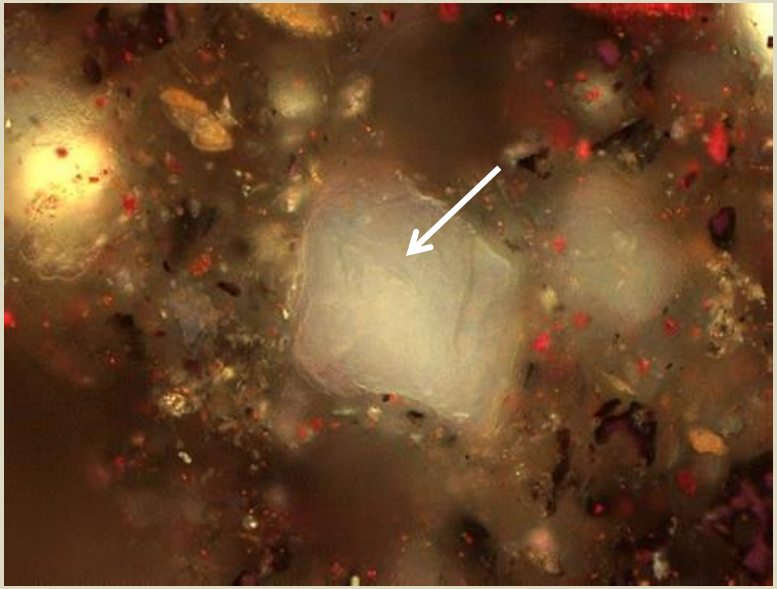
Fluidised Bed Combustion Fly Ash

Inorganics





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Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
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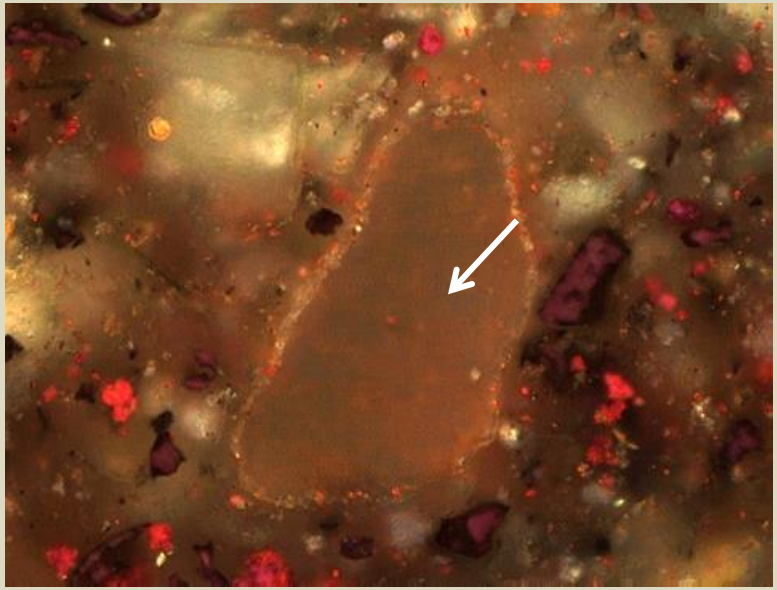
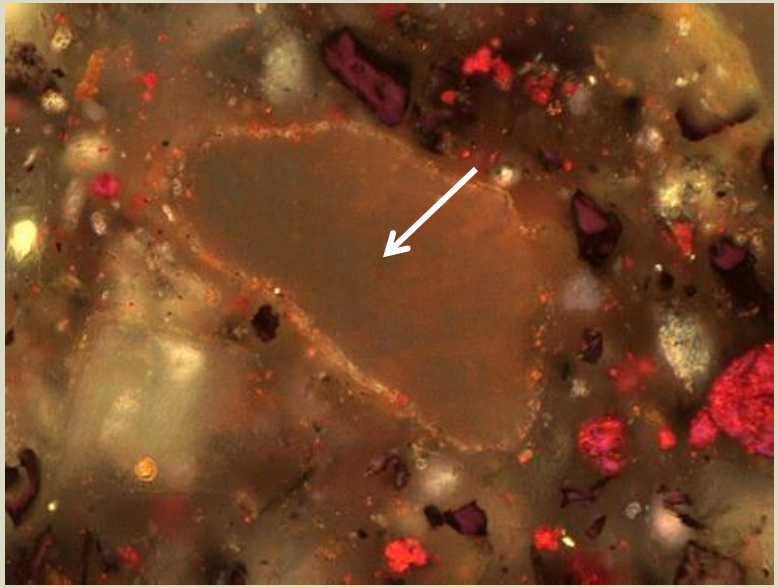
Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics





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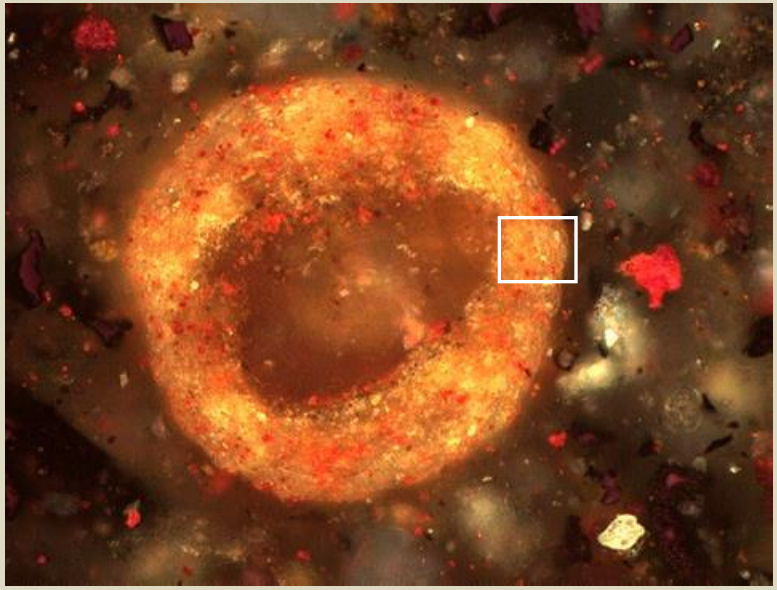
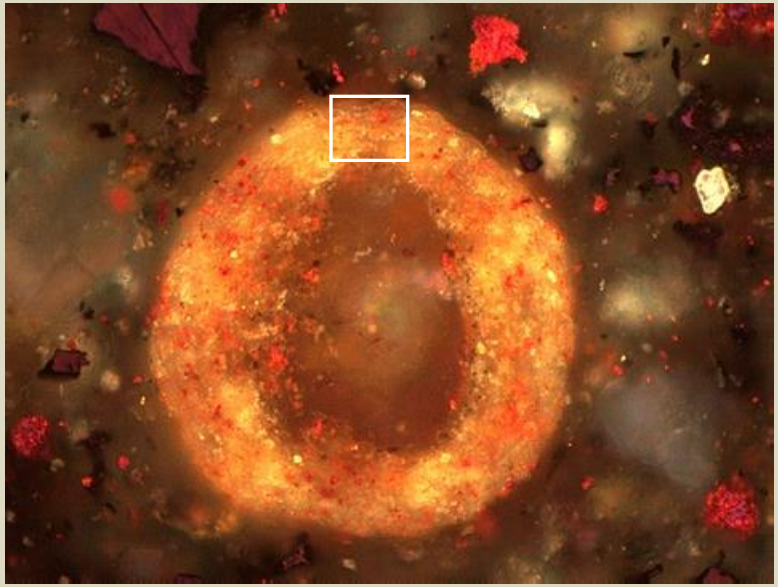
Fluidised Bed Combustion Fly Ash

Inorganics





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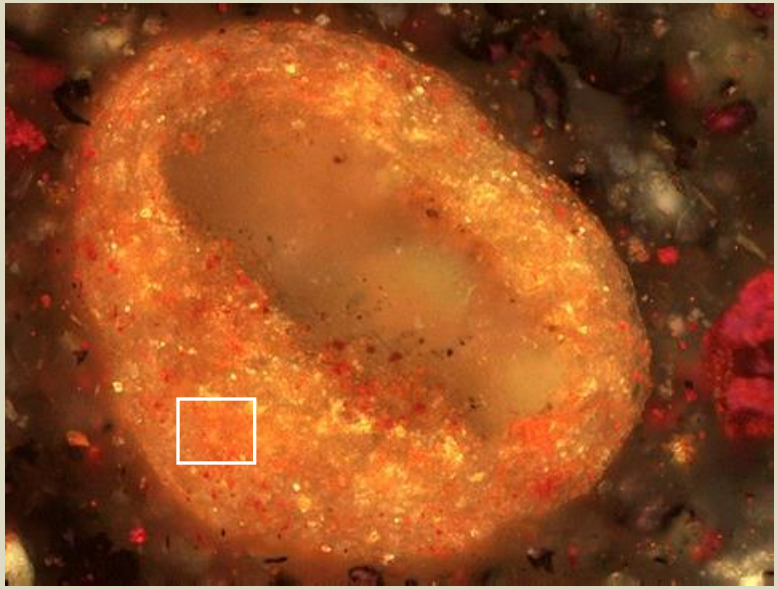
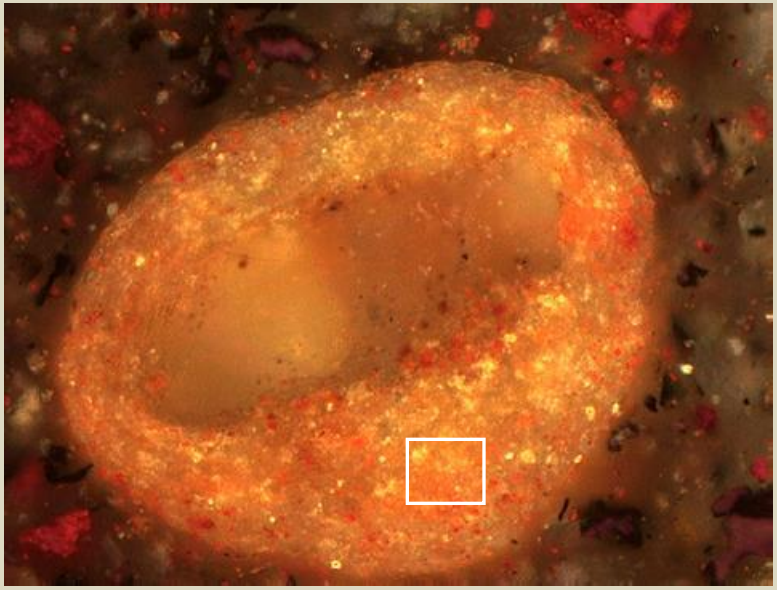
Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics





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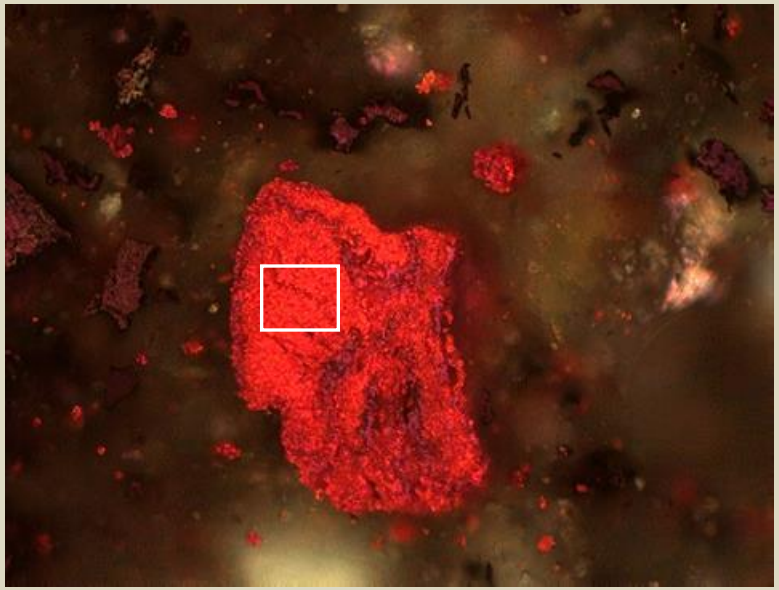
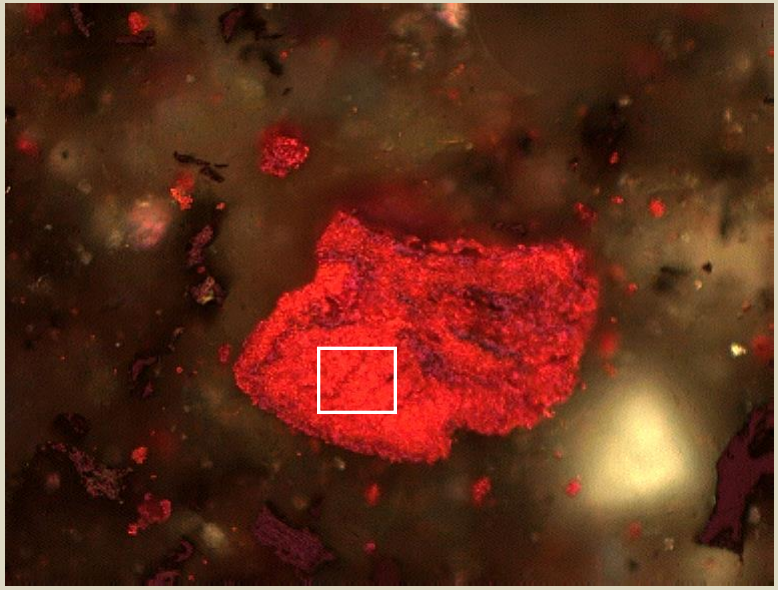
Fluidised Bed Combustion Fly Ash

Inorganics



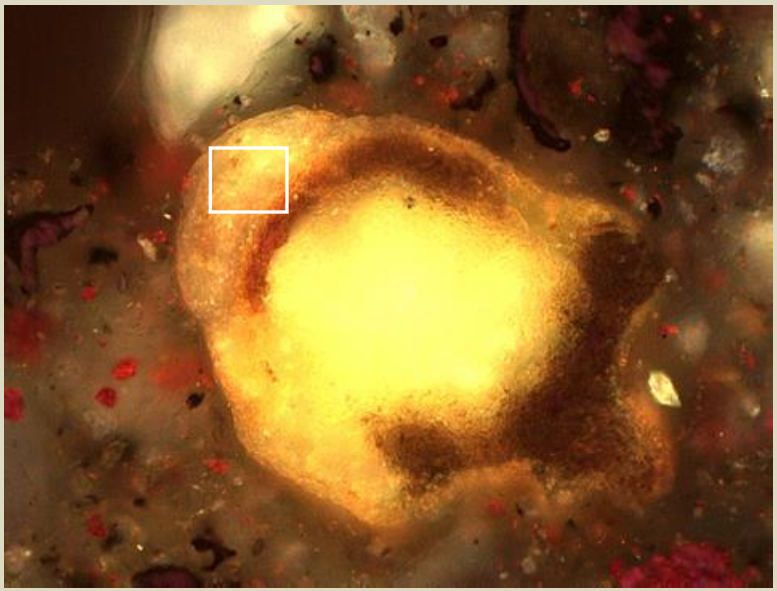


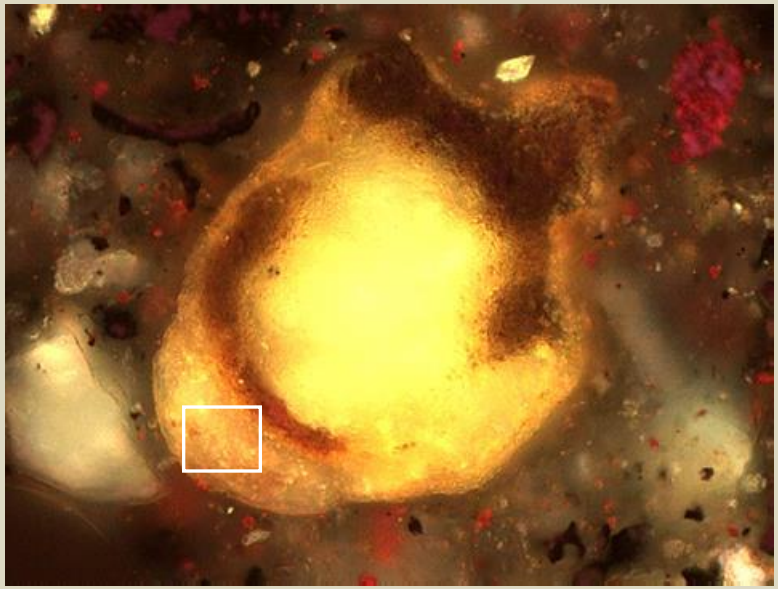
Origin	**Medium rank coal**
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash

Inorganics





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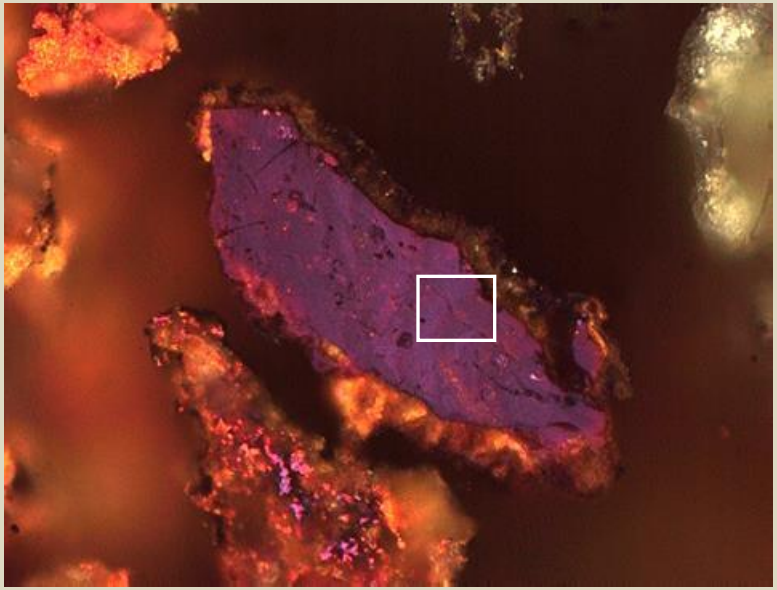
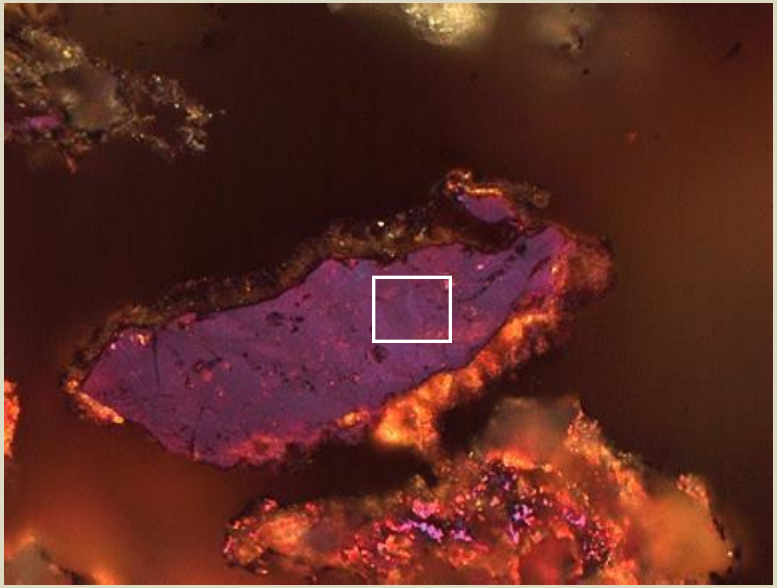
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
BIOMASS (sewage sludge + wood pellets)

Inorganics





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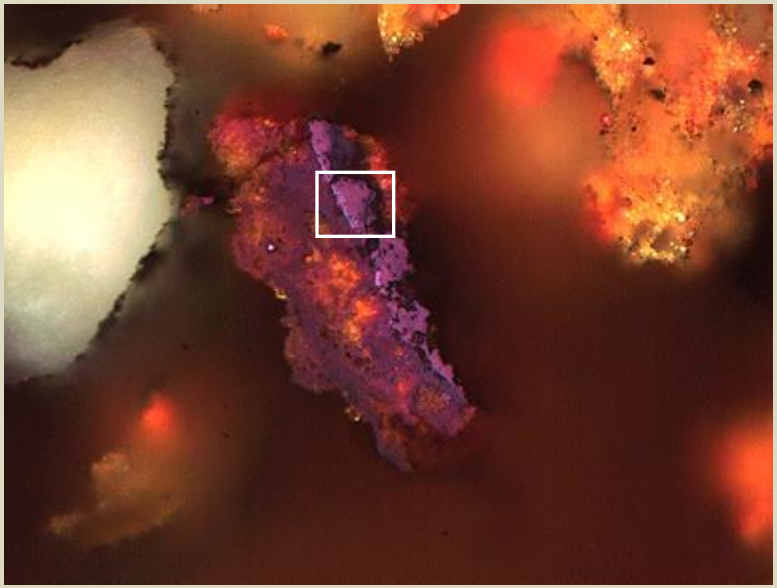
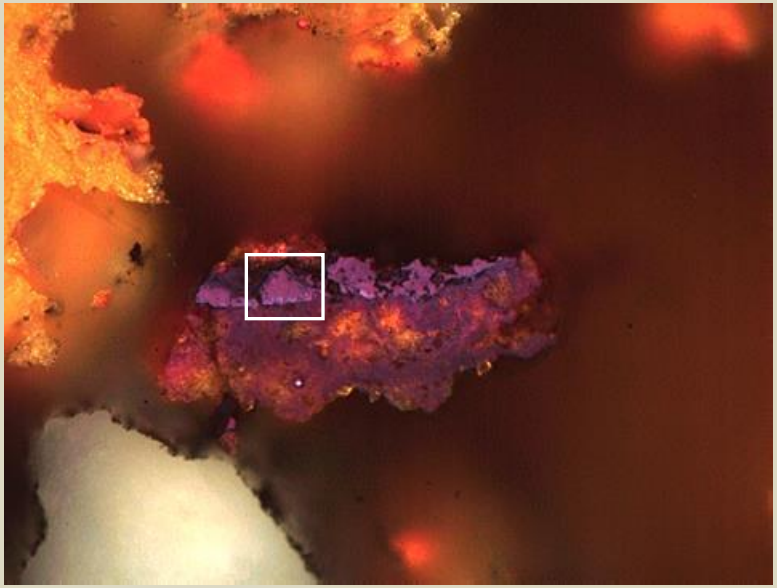
Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
BIOMASS (sewage sludge + wood pellets)

Inorganics





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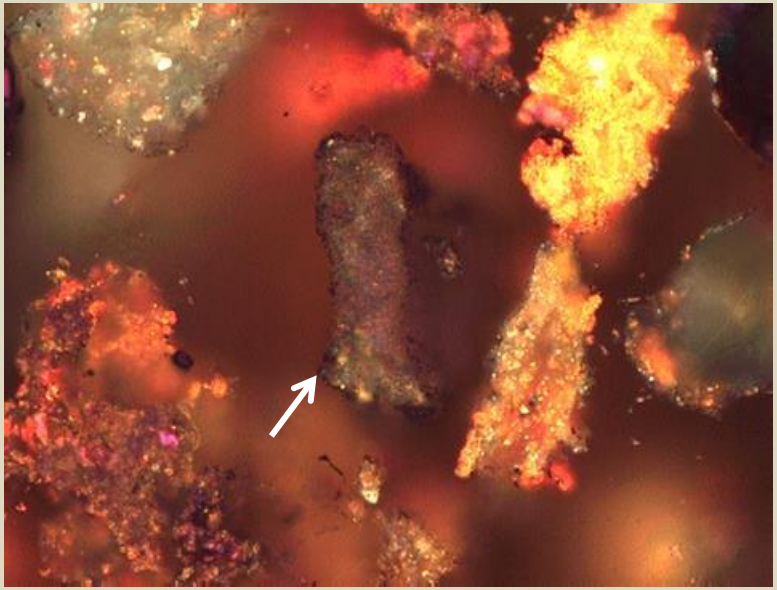
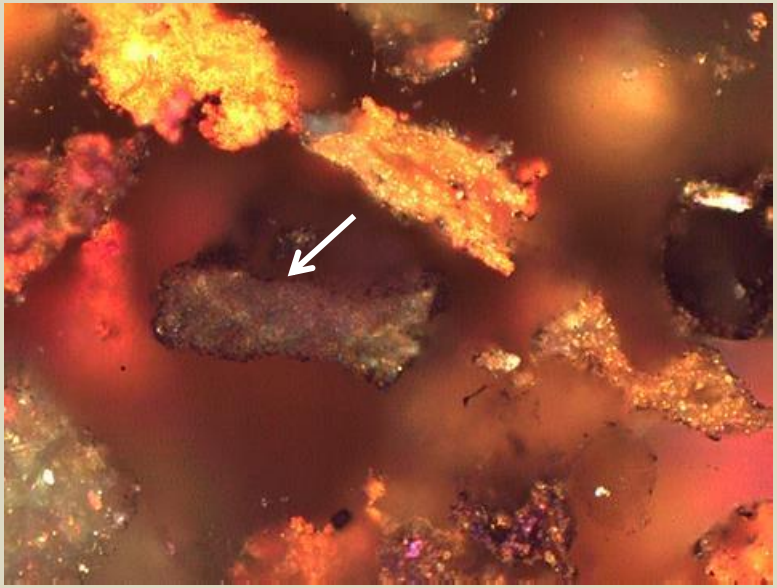
Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
BIOMASS (sewage sludge + wood pellets)

Inorganics



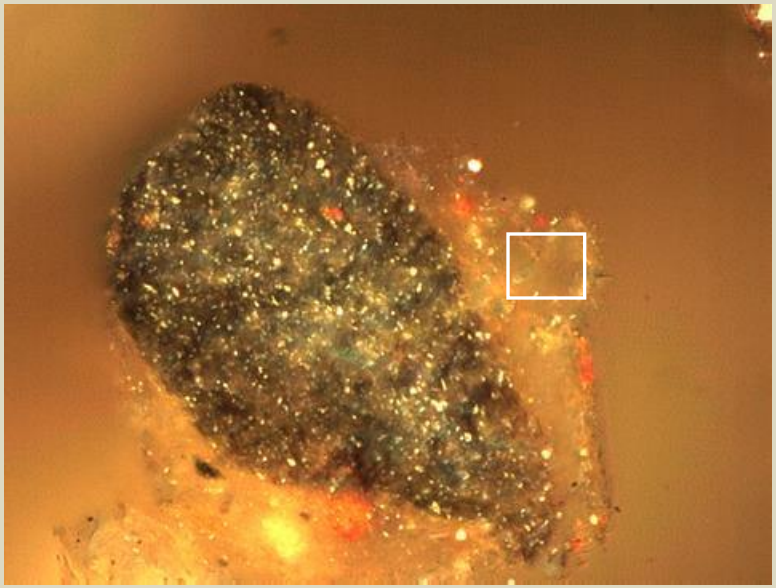


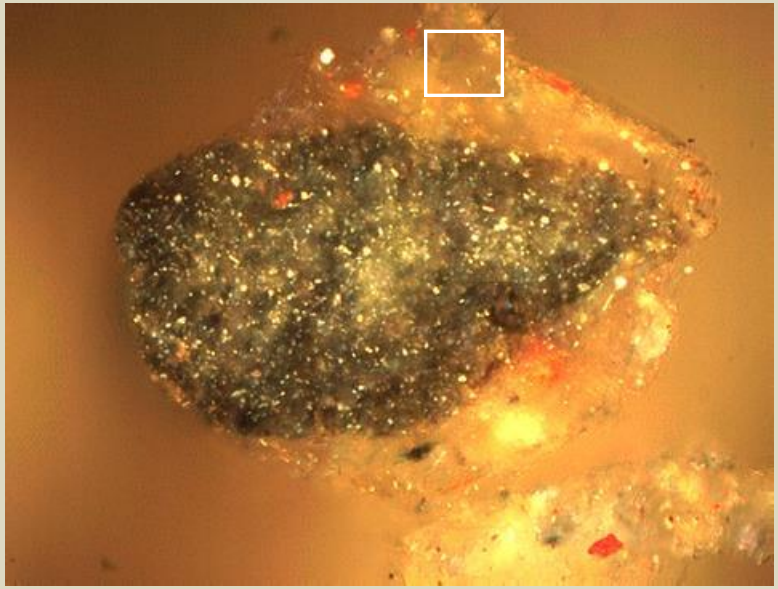
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
COAL TAILINGS + BIOMASS (wood pellets)

Inorganics





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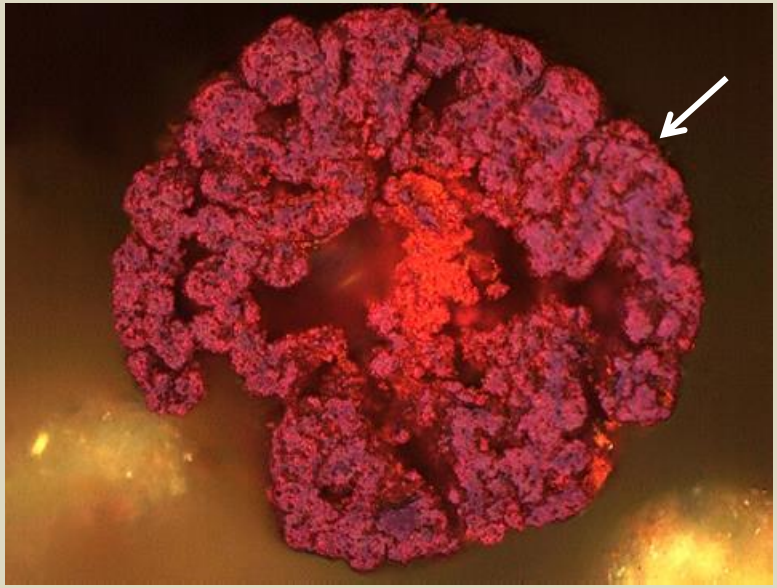
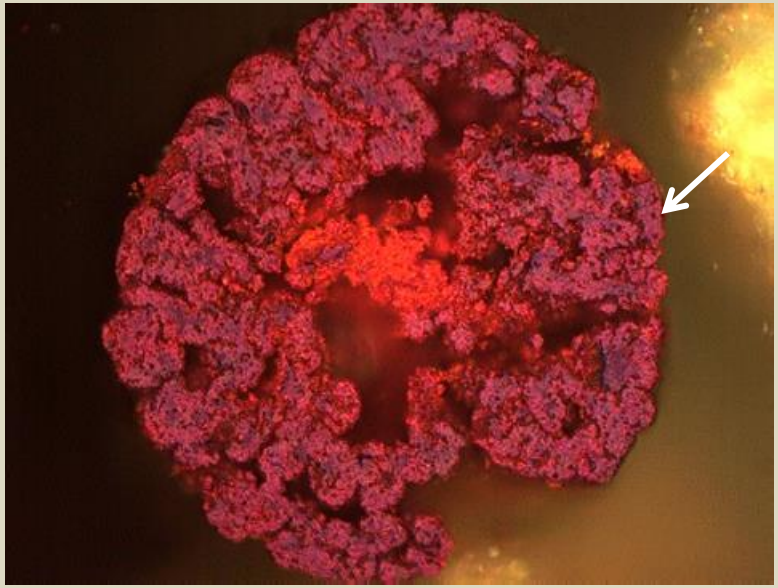
Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
COAL TAILINGS + BIOMASS (wood pellets)

Inorganics





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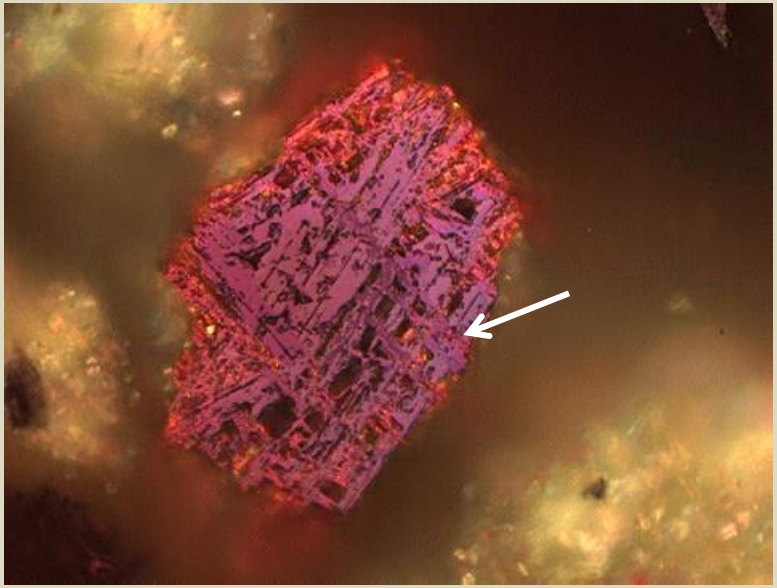
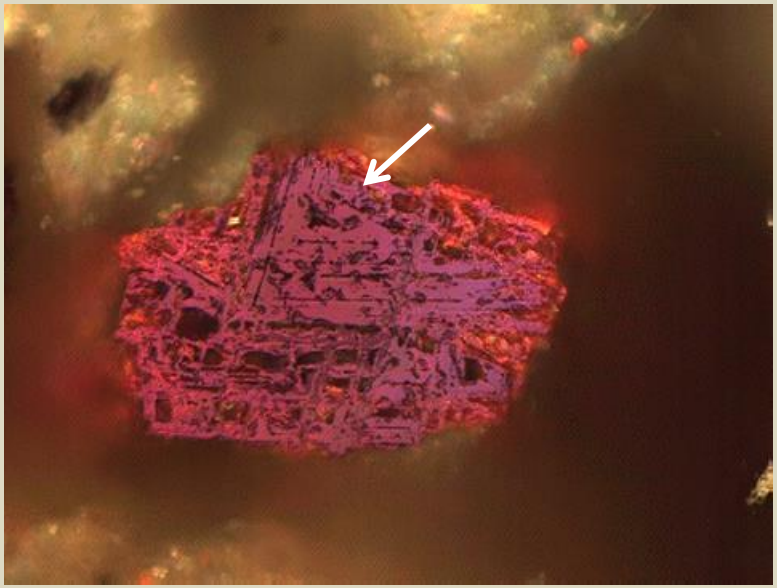
Fluidised Bed Combustion Fly Ash
COAL TAILINGS + BIOMASS (wood pellets)

Inorganics



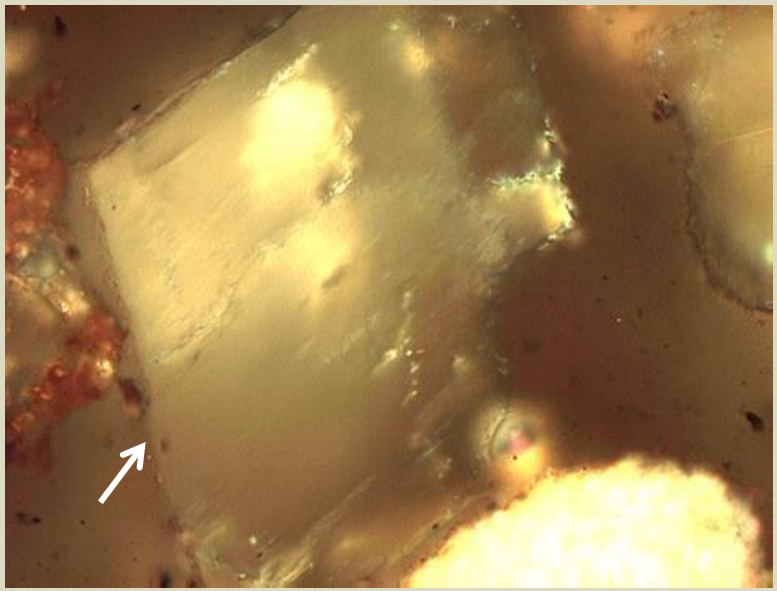


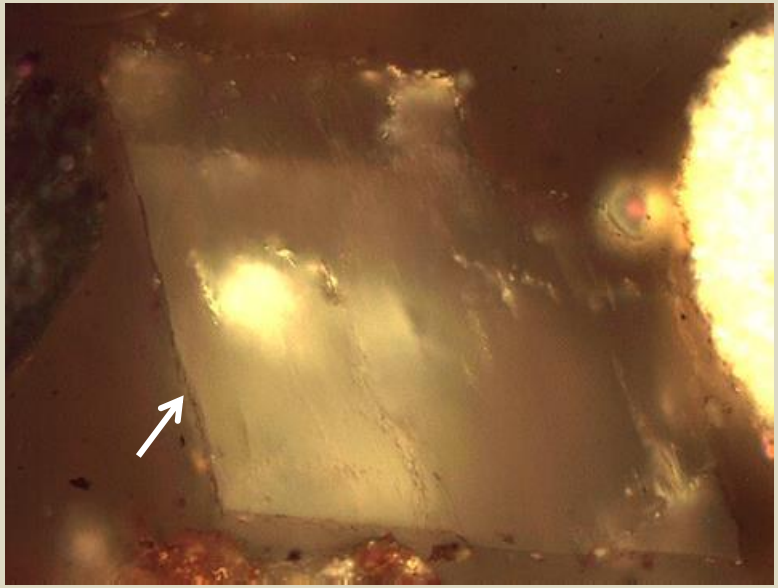
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics



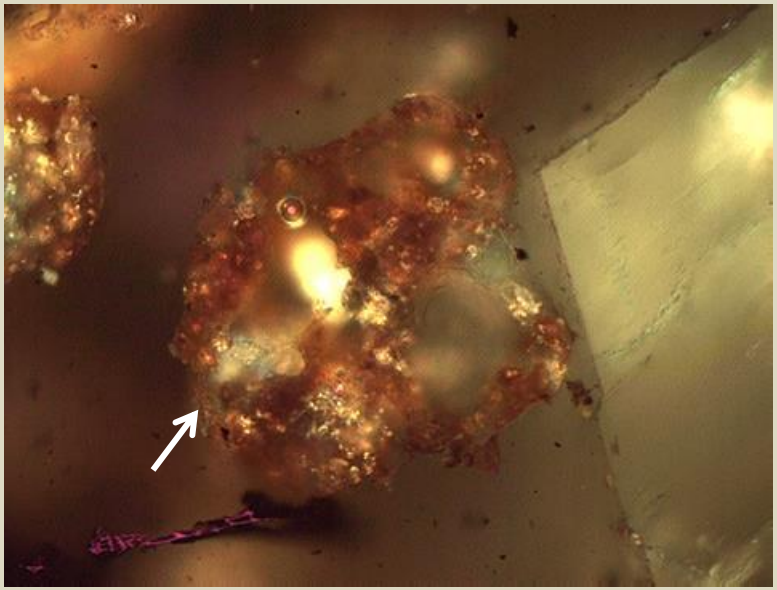


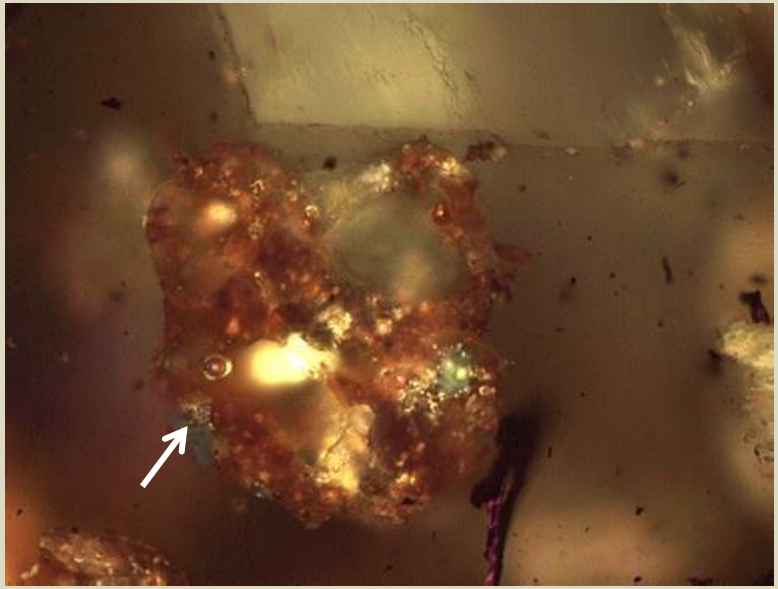
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics





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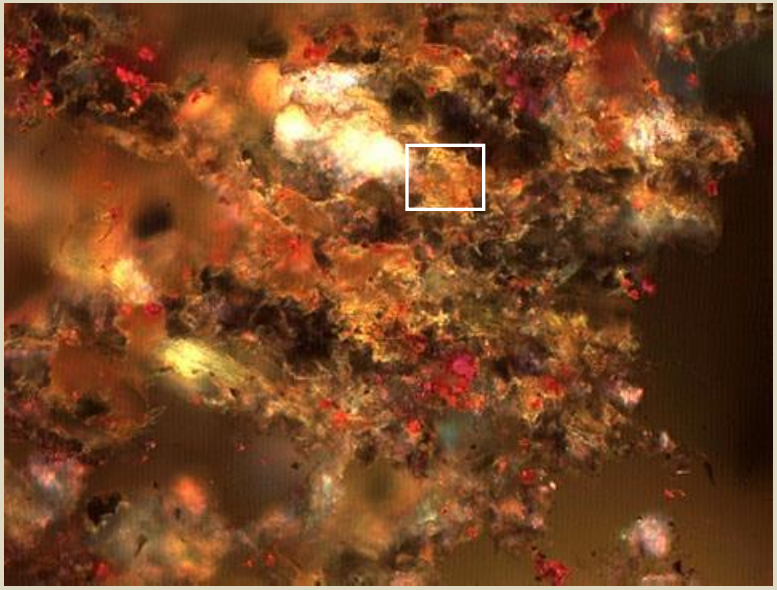
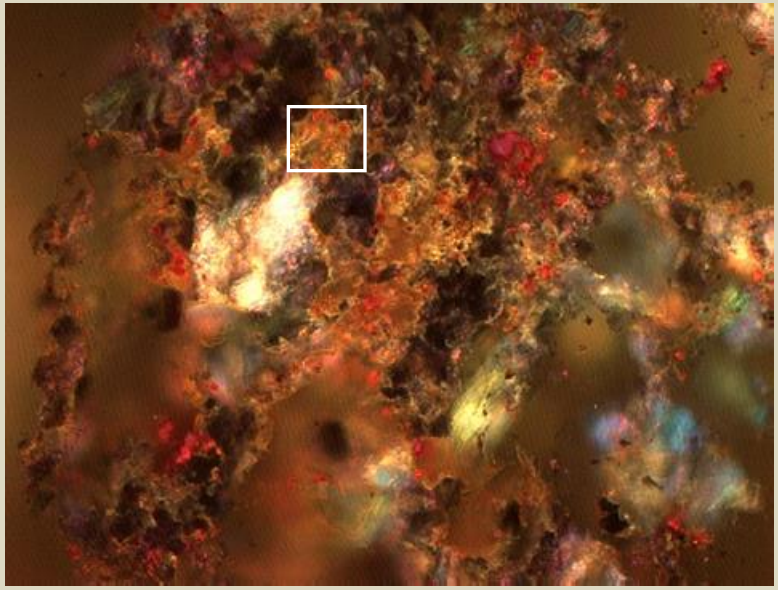
Long side of the pictures: 200 microns

Stoker Boiler Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics



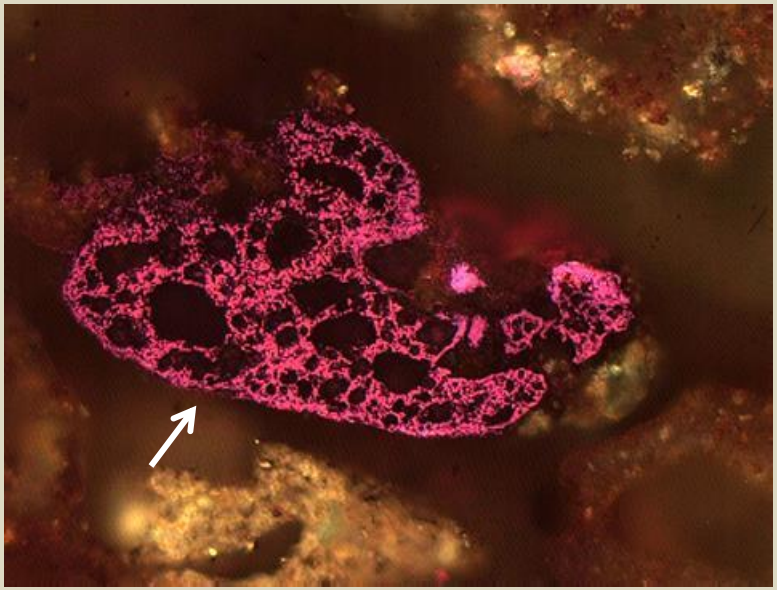


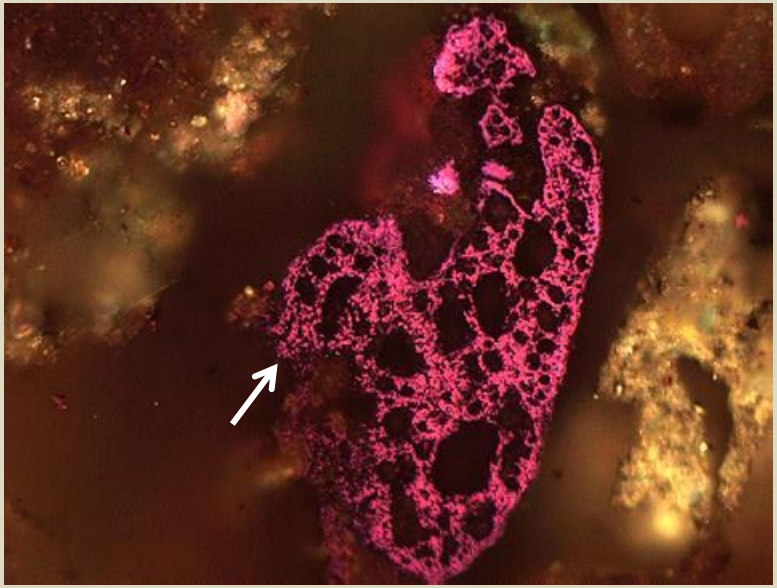
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics



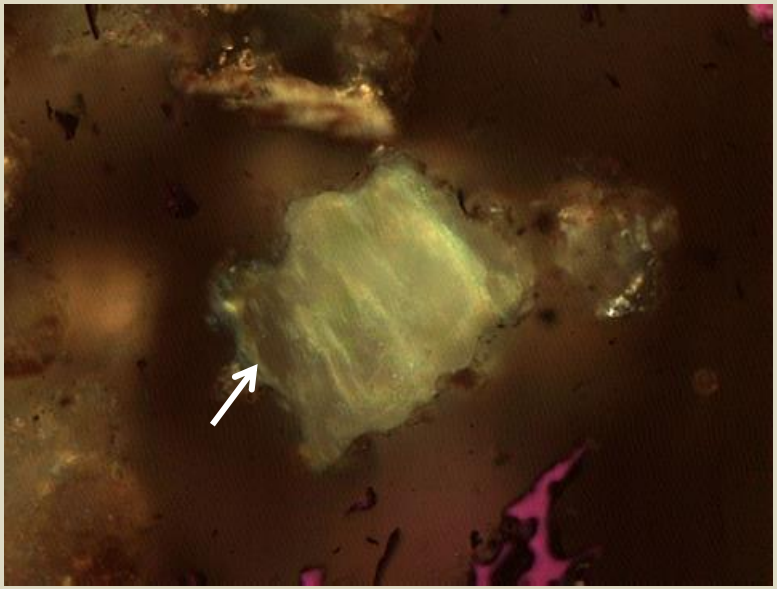


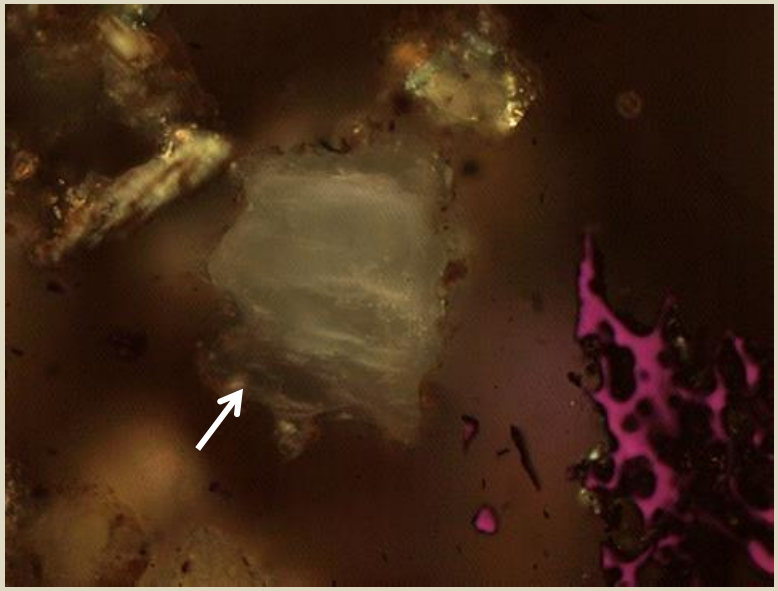
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics



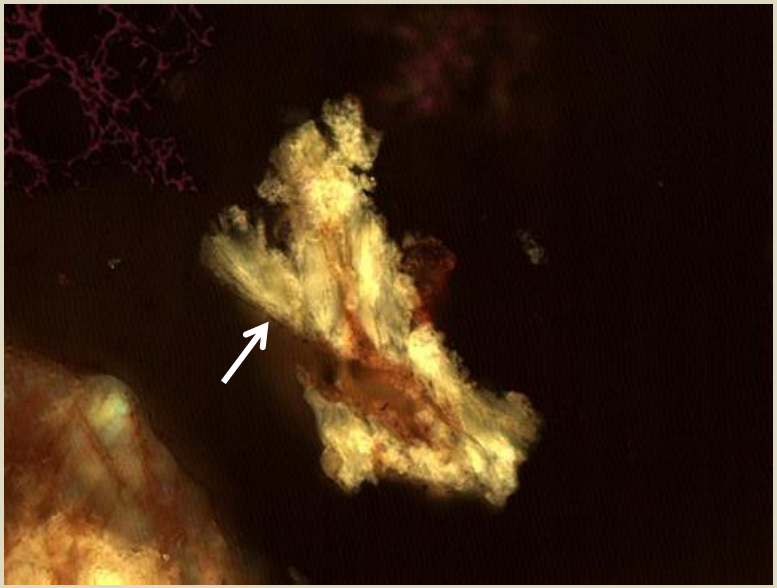


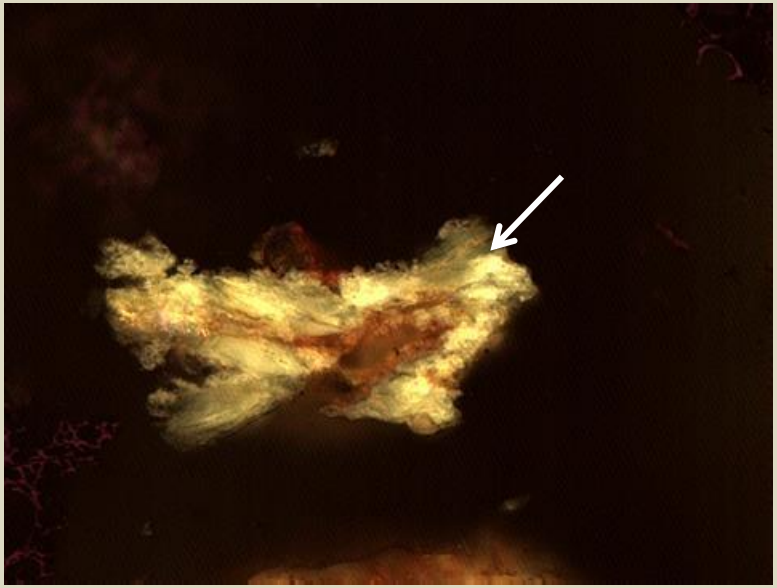
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics



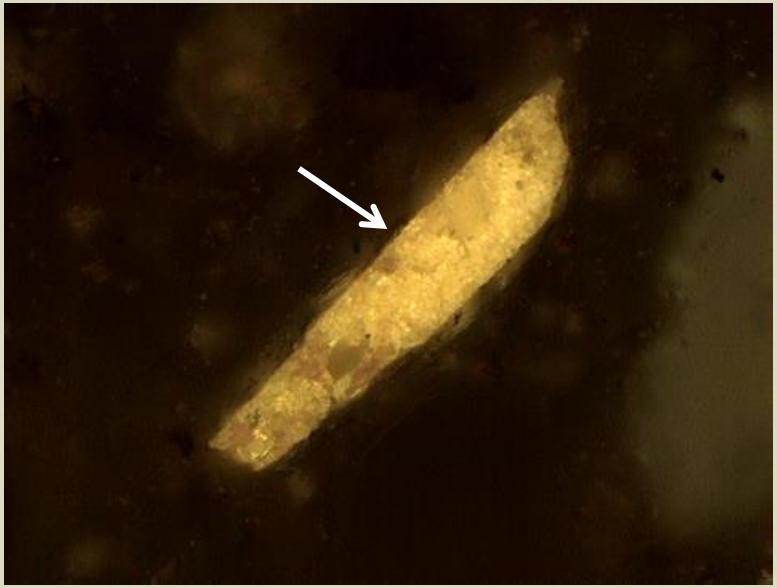


Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics

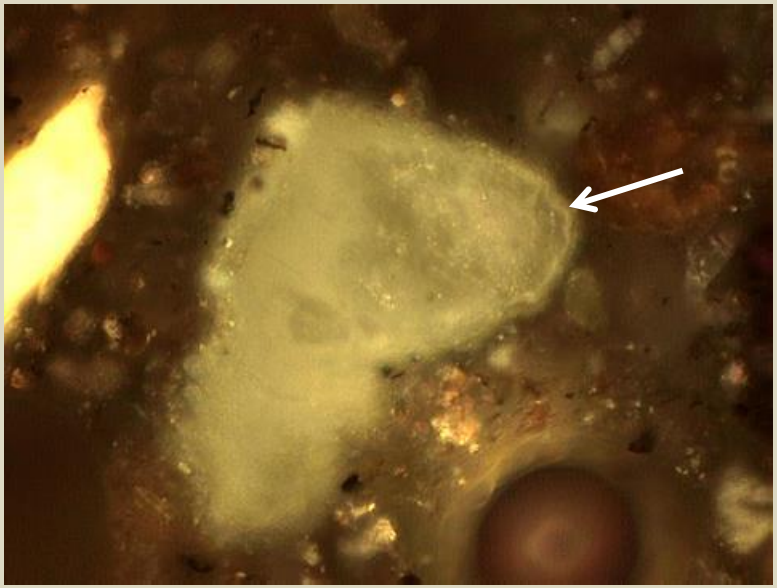


Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics

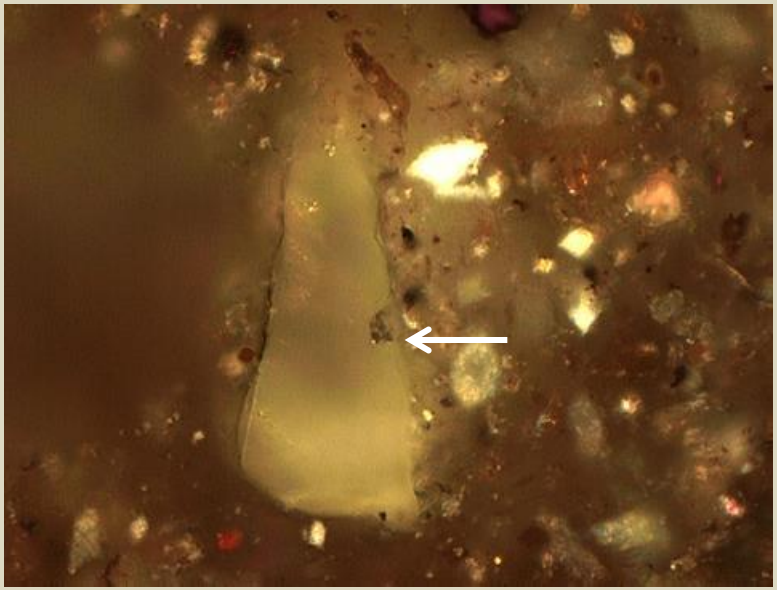


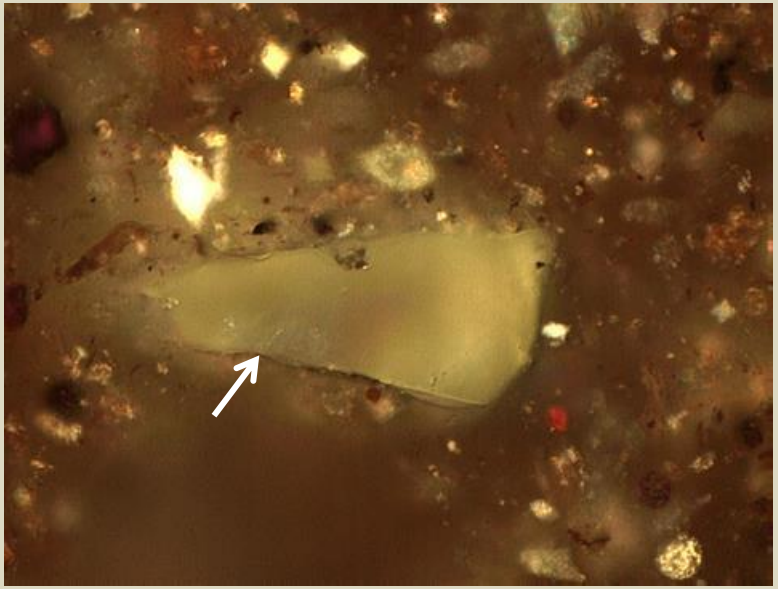
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics





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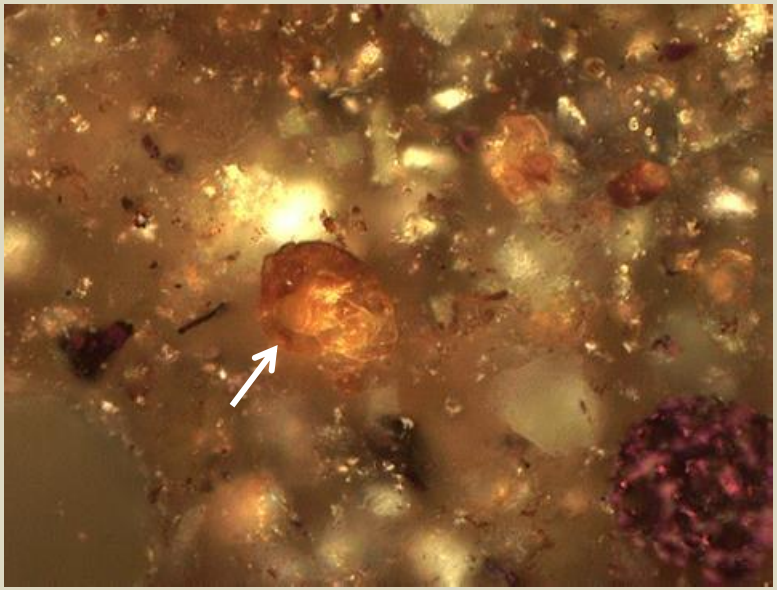
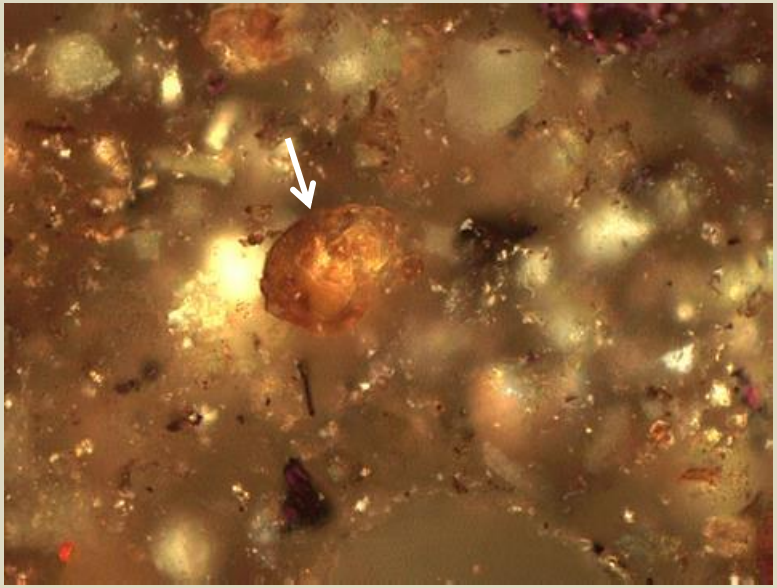
Stoker Boiler Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics



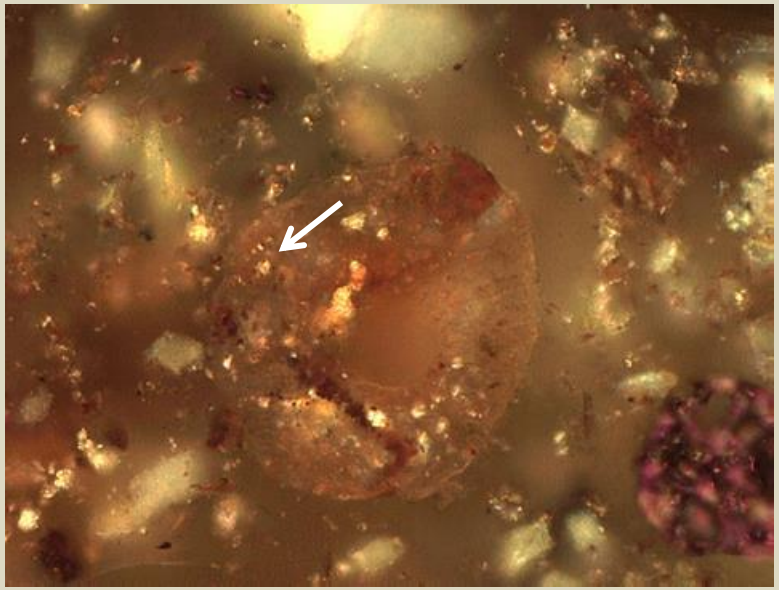


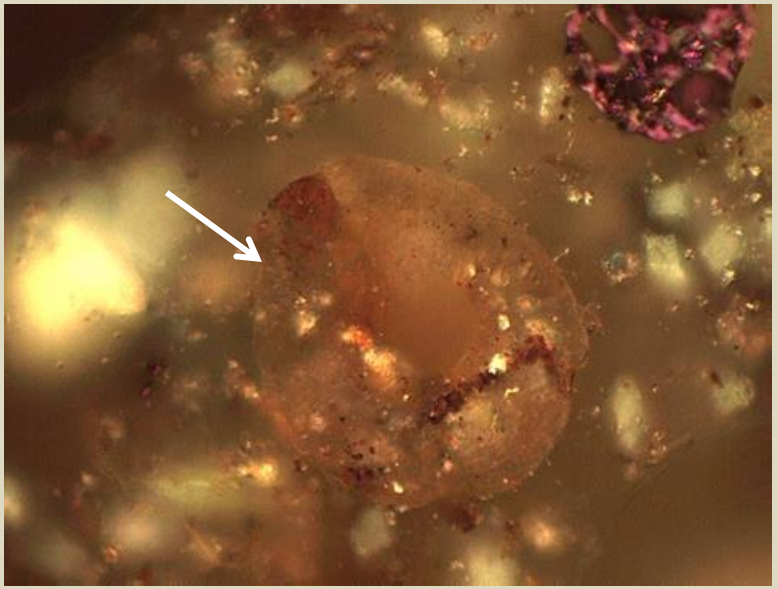
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Stoker Boiler Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics



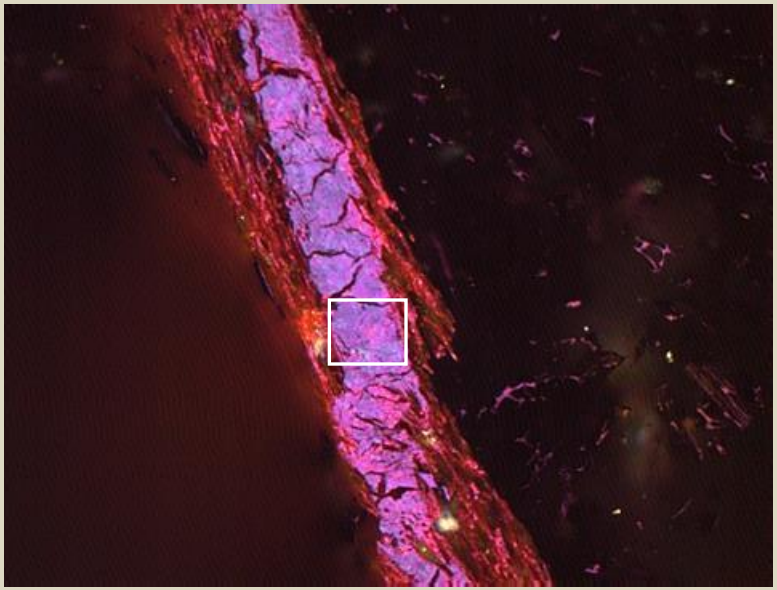


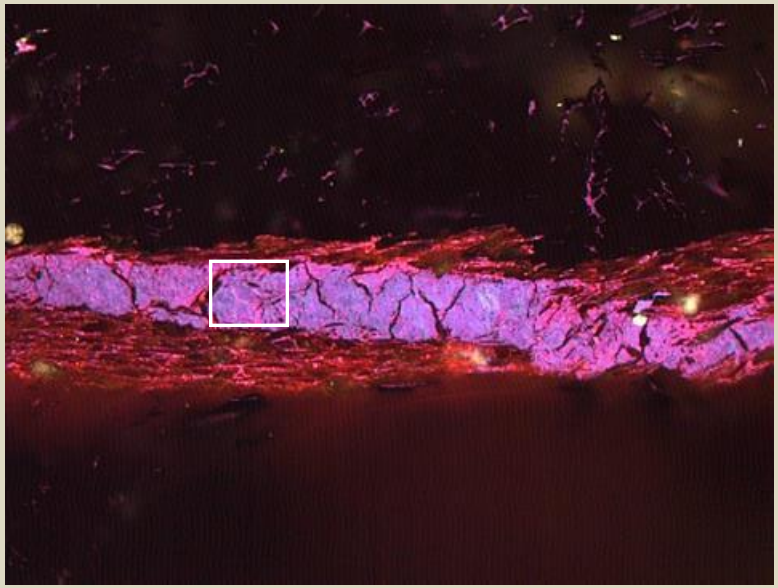
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics



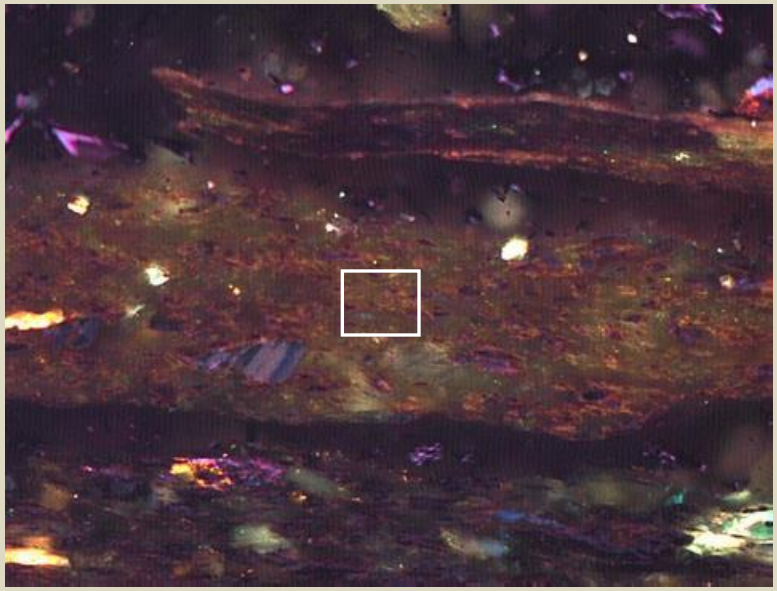


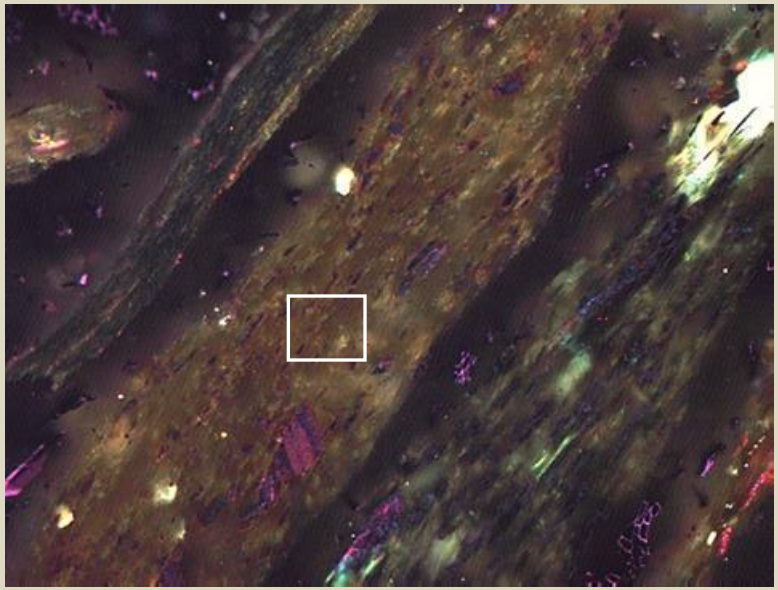
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics



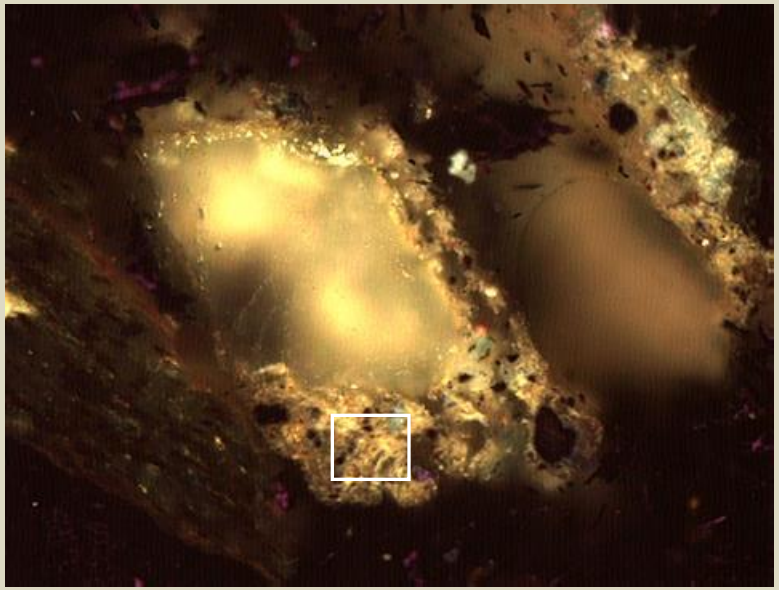


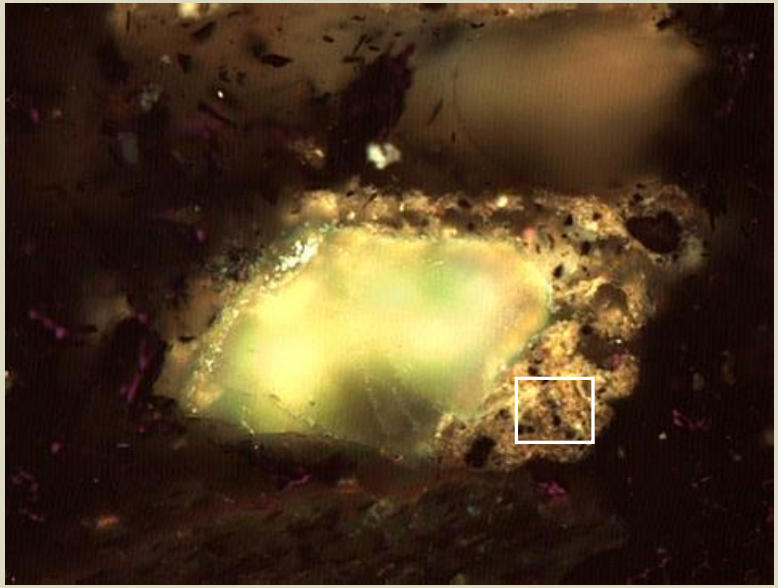
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics



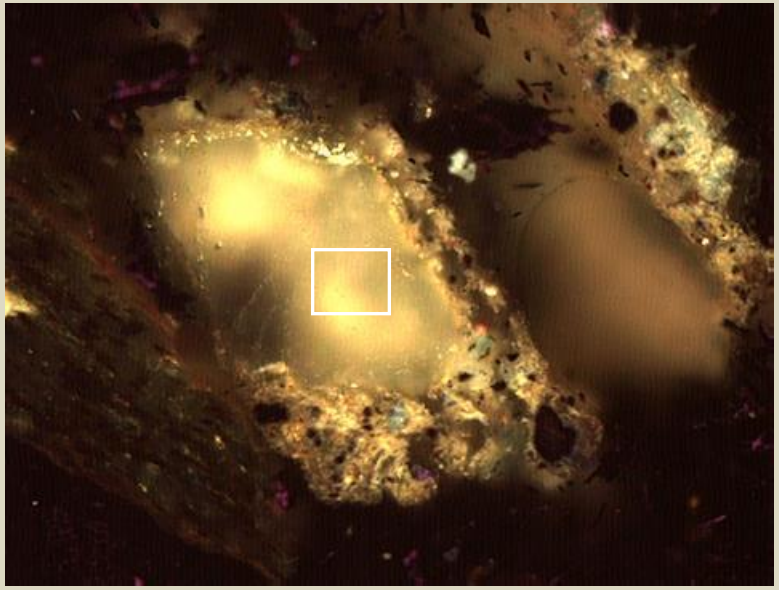


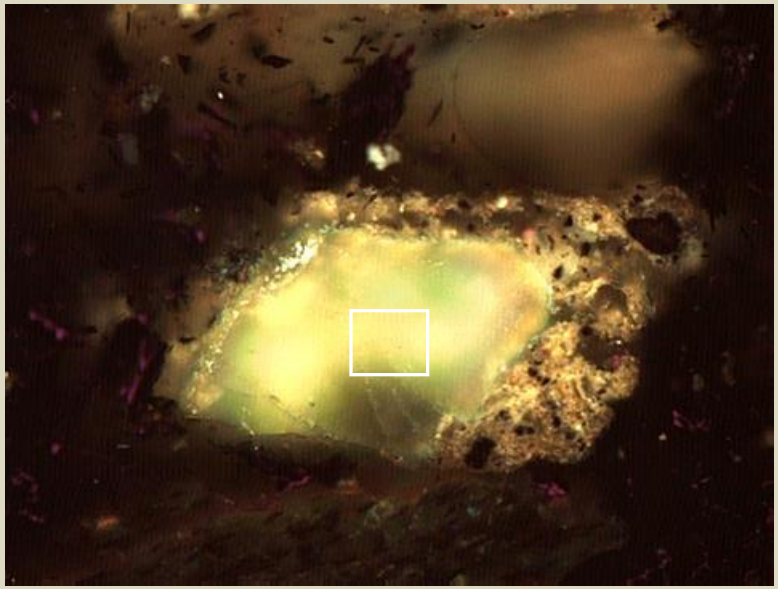
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics





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Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
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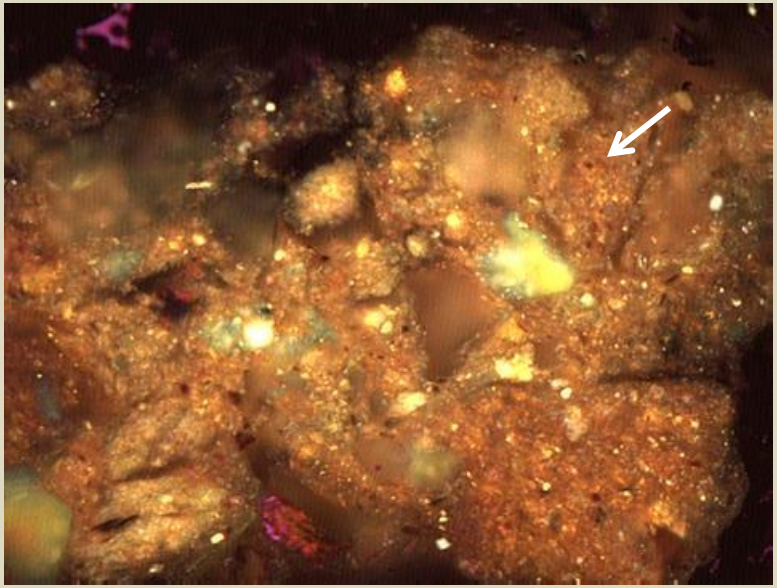
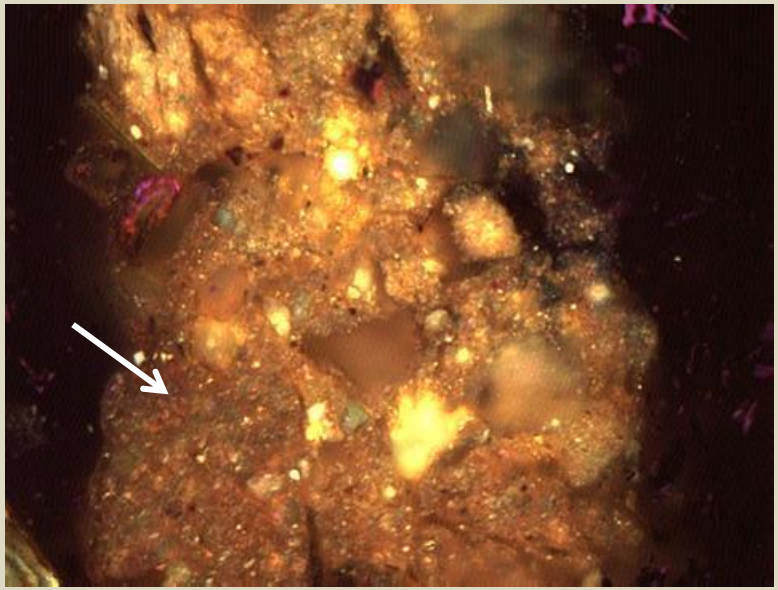
Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics



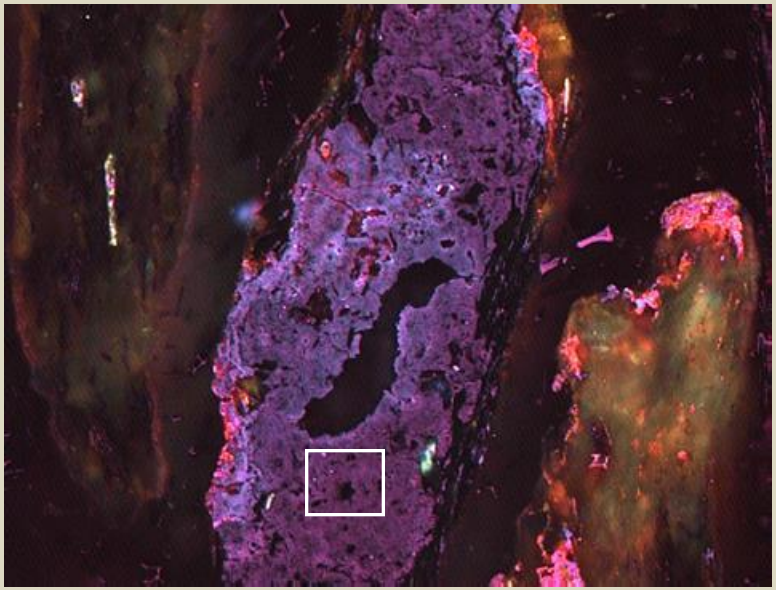


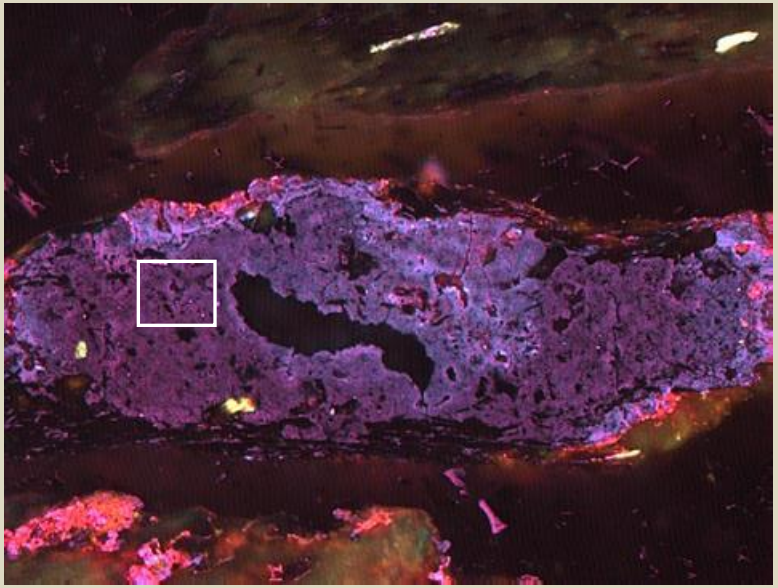
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics



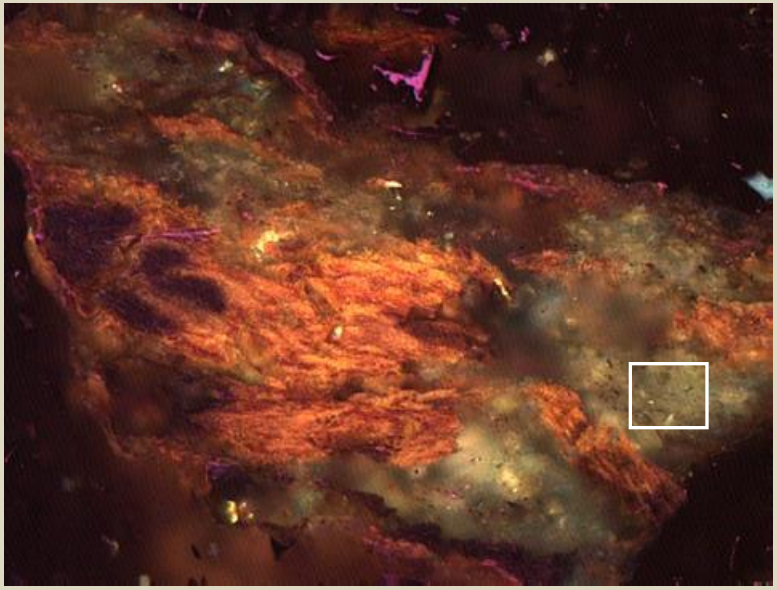


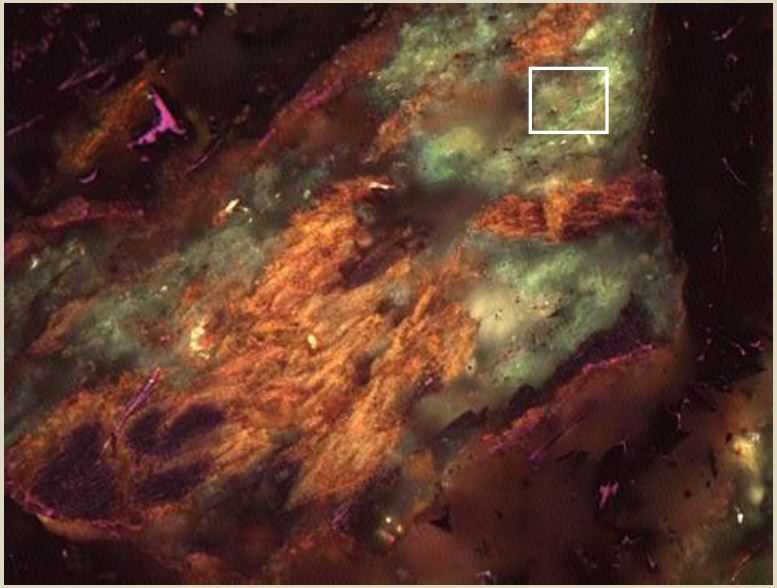
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics



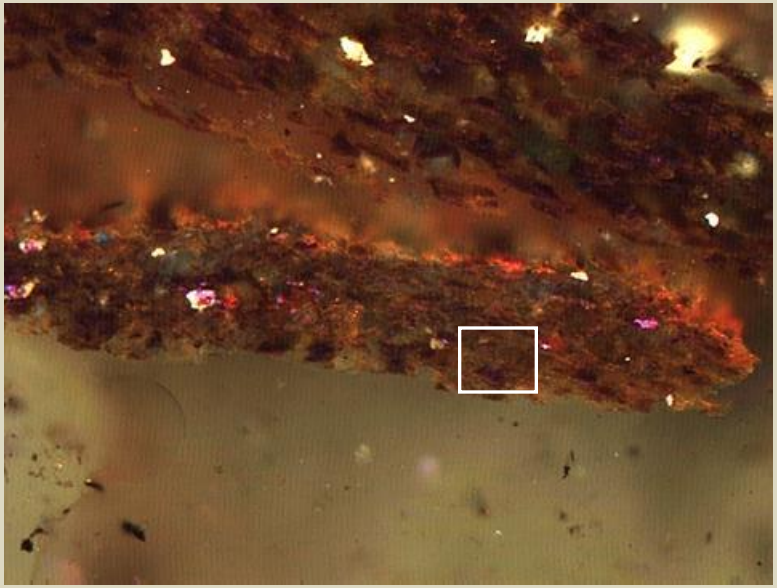


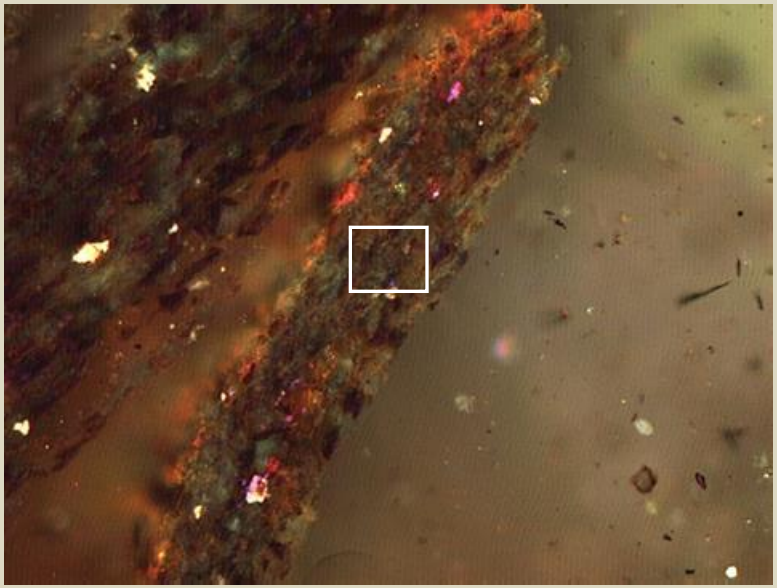
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics



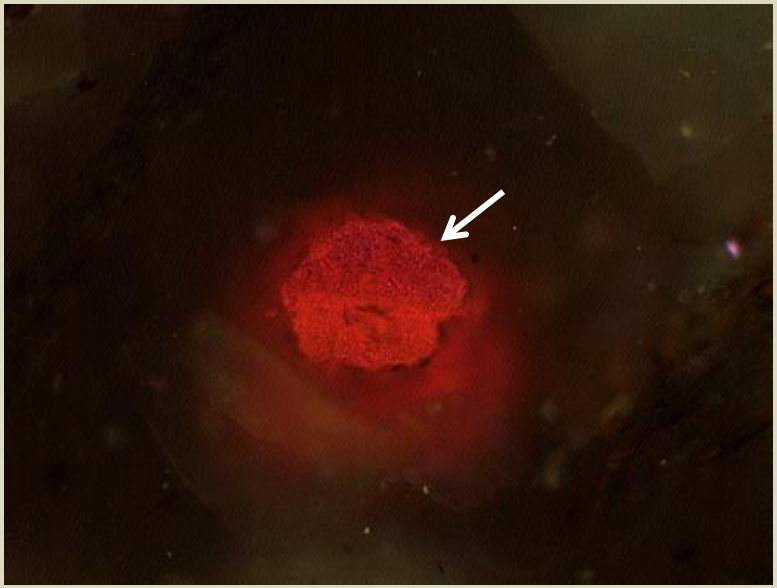


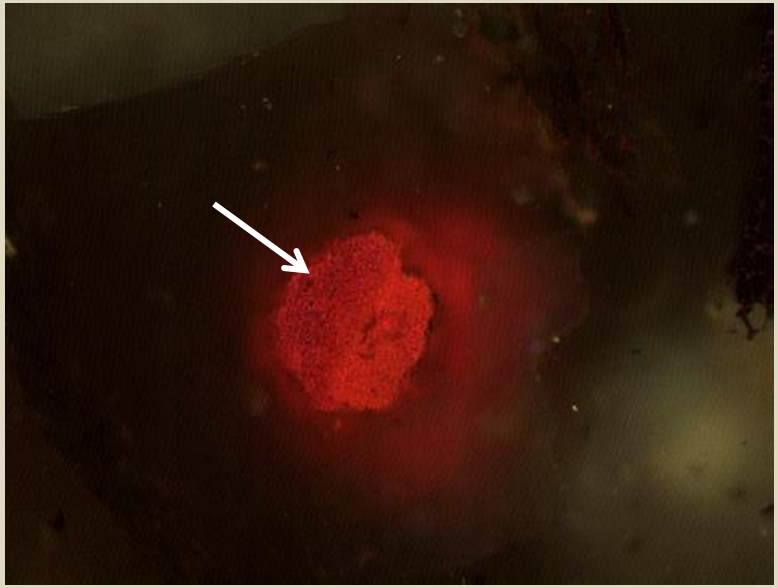
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics



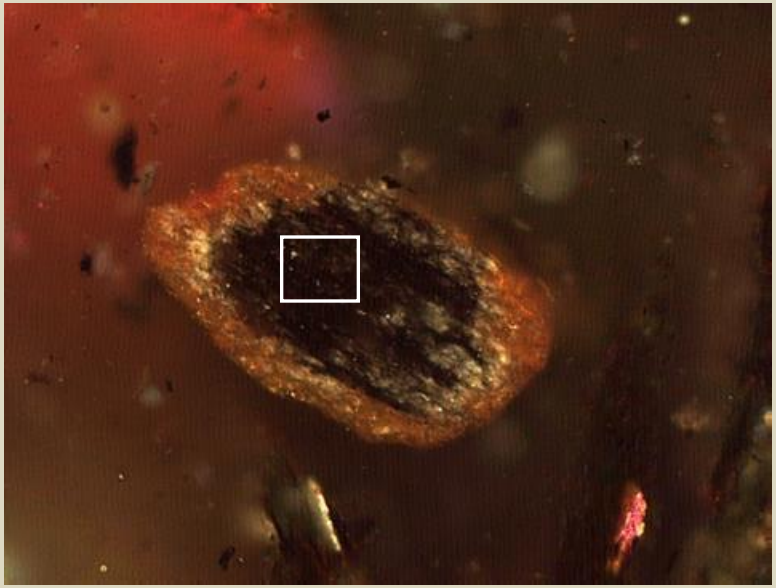


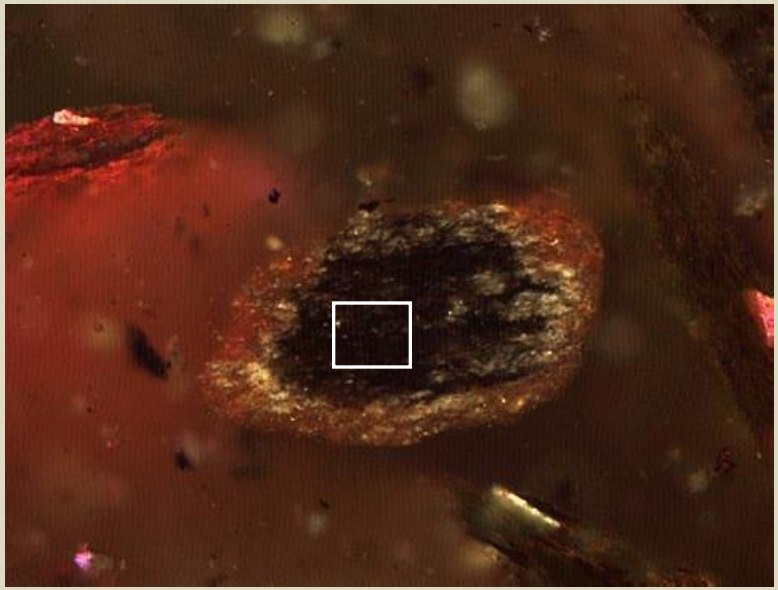
Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

Fluidised Bed Combustion Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics





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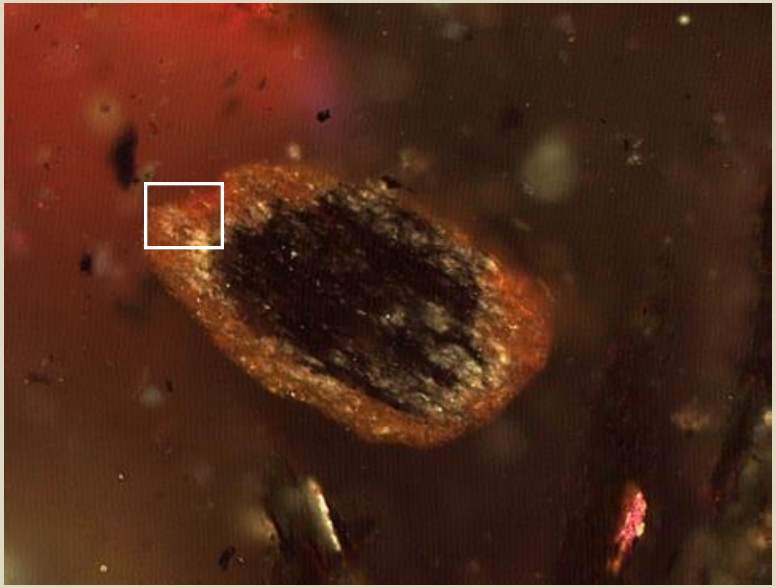
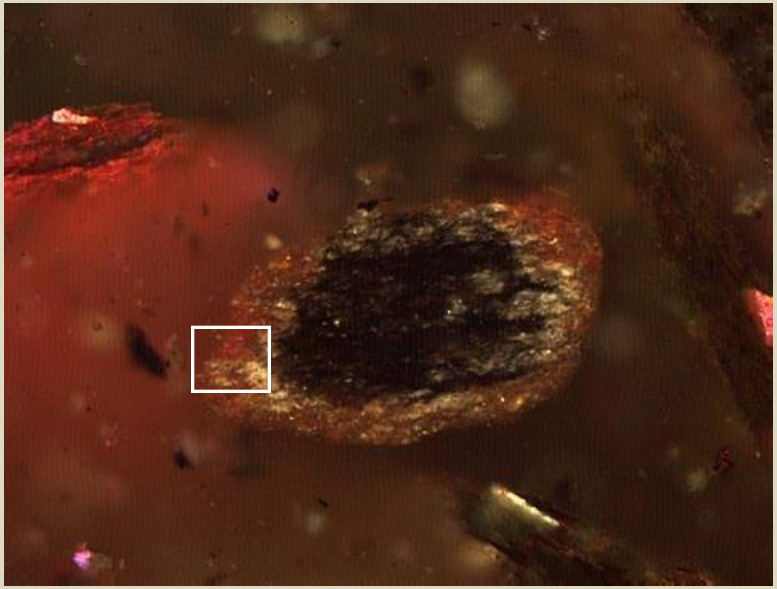
FOREST BIOMASS (Eucalyptus)

Inorganics





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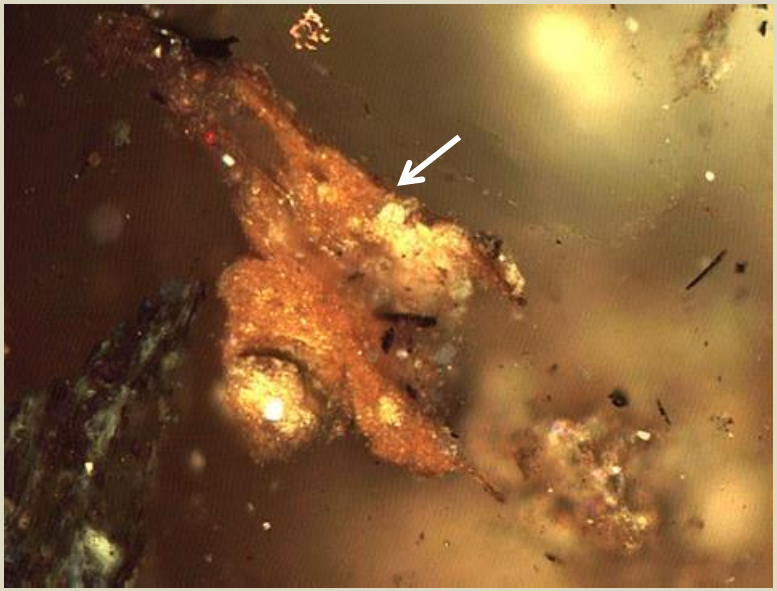

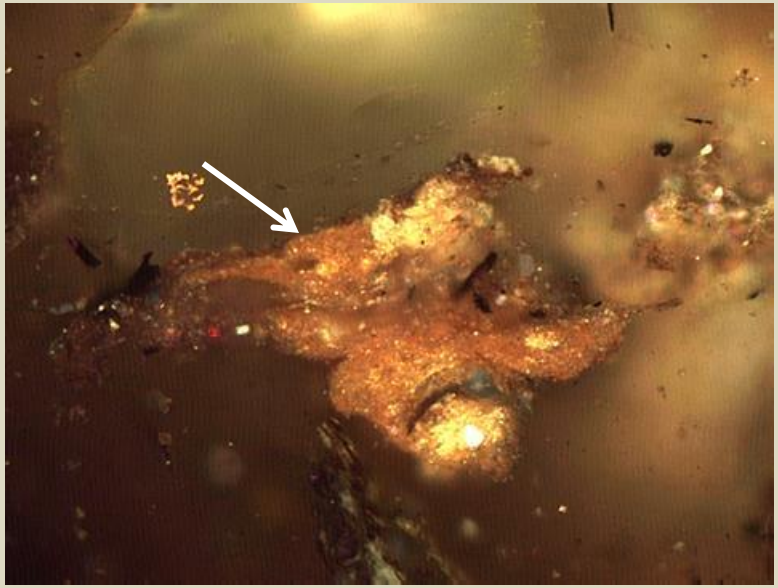

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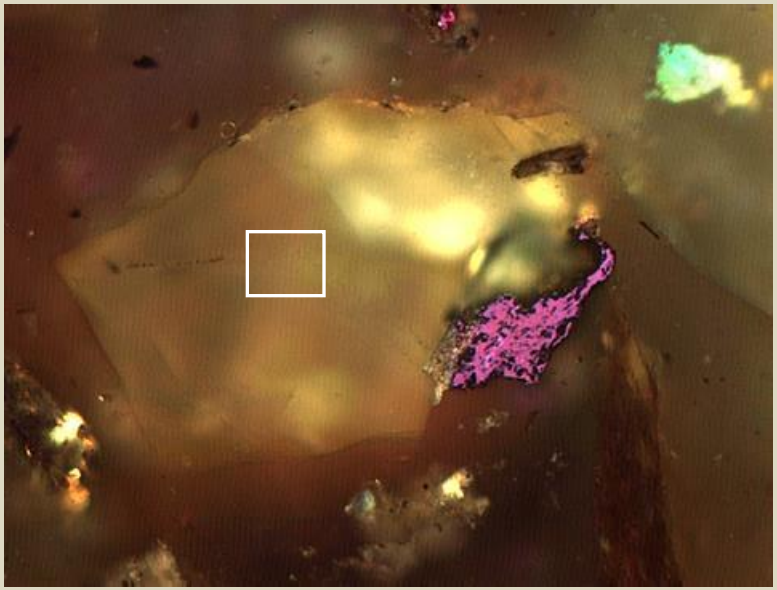
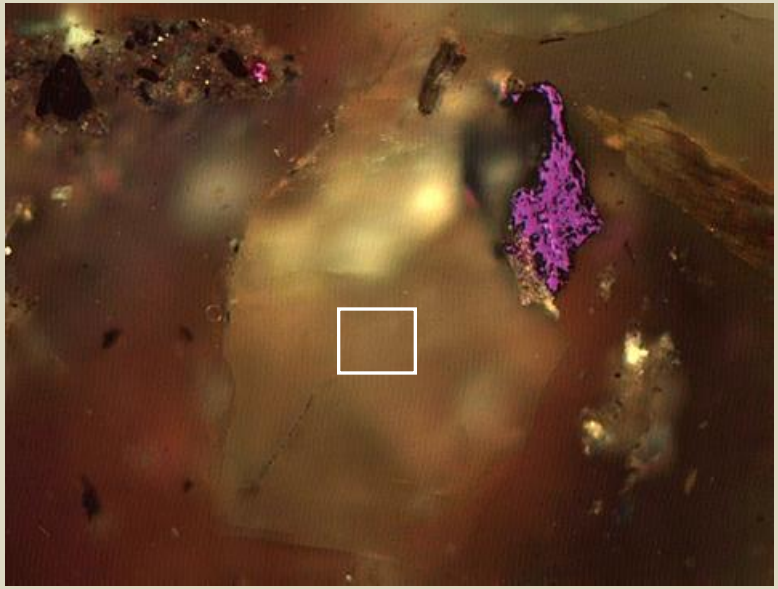
Fluidised Bed Combustion Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics





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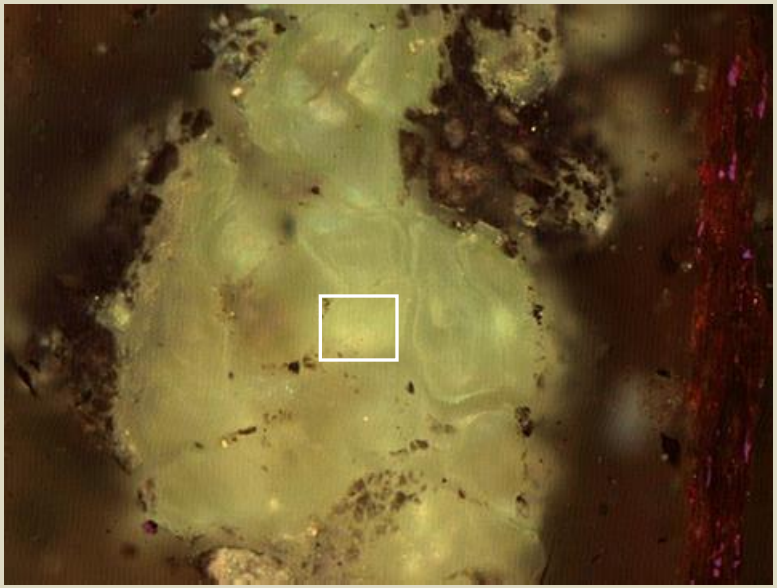
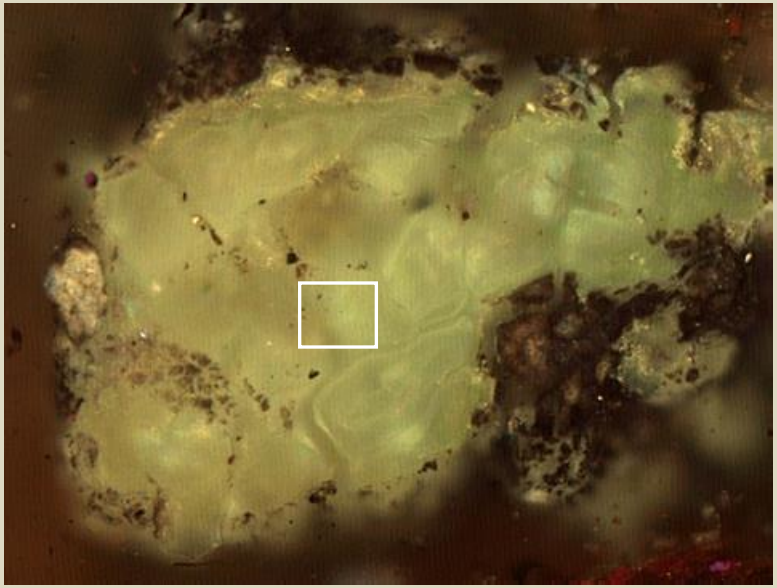
Fluidised Bed Combustion Fly Ash
FOREST BIOMASS (Eucalyptus)

Inorganics





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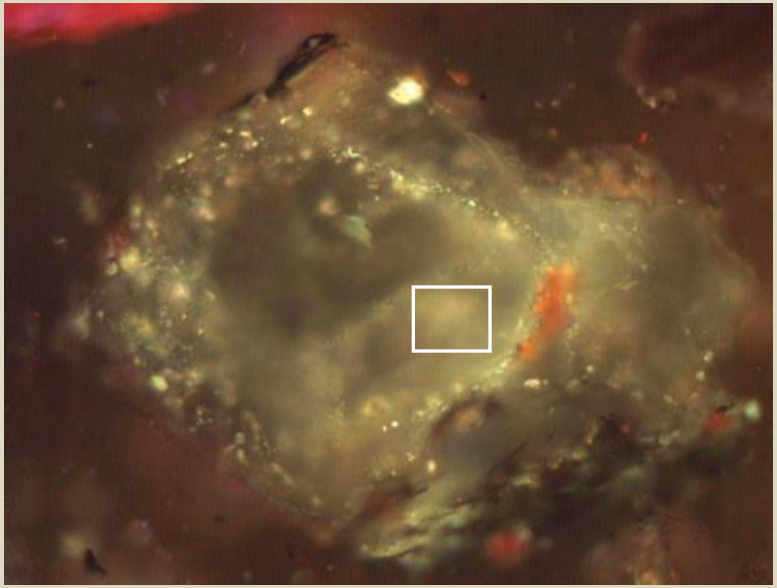
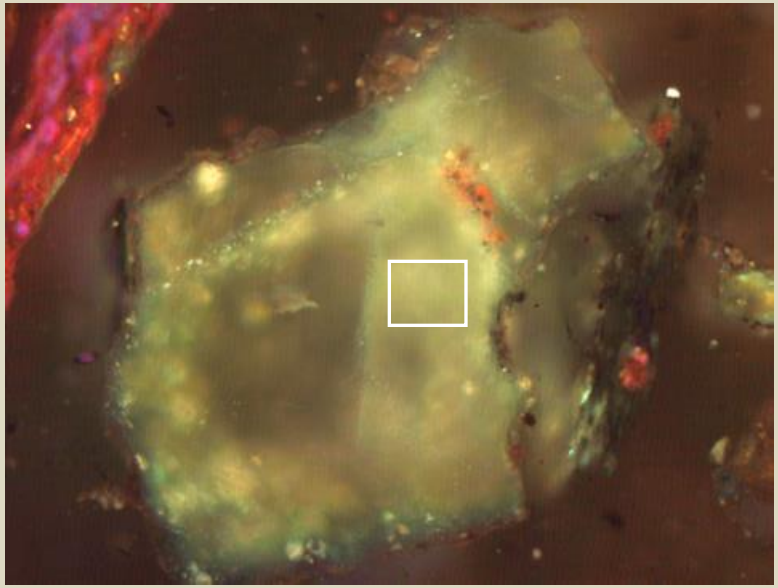
FOREST BIOMASS (Eucalyptus)

Inorganics





Level # 1 - Nature: whole particle identification:	**Inorganic**
Level # 2 - Composition (Metallic/Non-Metallic)	**Non-Metallic**
Level # 3 - Type of particle (Char Classification): whole particle identification:	**Mineroid**

Long side of the pictures: 200 microns

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Referencing this ATLAS:

Suárez-Ruiz, I., Valentim, B., Borrego, A.G., Bouzinos, A., Flores, D., Kalaitzidis, S., Malinconico, M.L., Marques, M., Misz-Kenan, M., Predeanu, G., Montes, J.R., Rodrigues, S., Savalas, G., Wagner, N., 2015. Petrographic Classification of Fly Ash Components. International Committee for Coal and Organic Petrology (ICCP; www.iccop.org). Open file (www.iccop.org) ISBN: 978-84-608-1416-0
203 pp.