ICCP COMMISSION III

Self – heating of coal and coal wastes working group

2010 Round Robin Exercise

Conveyors:
Magdalena Misz-Kennan
Deolinda Flores
Jolanta Kus

UNIWERSYTET ŚLĄSKI W KATOWICACH
BGR Bundesanstalt für Geowissenschaften und Rohstoffe
U.PORTO FACULDADE DE CIÊNCIAS UNIVERSIDADE DO PORTO

Aims of the 2010 Round Robin Exercise:

- to gather examples of various forms of transformation of organic matter in coal wastes
- to attempt a classification of these self-heating induced transformations

The list of participants:

- Sławomira Pusz (Polish Academy of Sciences, Poland)
- James Hower (University of Kentucky, USA)
- Ivana Sýkorová (Academy of Sciences of the Czech Republic)
- Jen O'Keefe (Morehead State University, USA)
- Deolinda Flores (Universidade do Porto, Portugal)
- Claudio Avila (University of Nottingham, Great Britain)
- Dragana Životić (University of Belgrade, Serbia)
- Joana Ribeiro (Universidade do Porto, Portugal)
- Manuela Marques (Universidade do Porto, Portugal)
- Nikki Wagner (University of Witwatersrand, South Africa)
- Isabel Suárez-Ruiz (Instituto Nacional del Carbón, Spain)
- Stavros Kalaitzidis (University of Patras, Greece; BMA Geological Services, Australia)
- Kimon Christanis (University of Patras, Greece)
- Sandra Rodrigues (Universidade do Porto, Portugal)

Localities of samples:

- S. Pedro da Cova, Lomba and Midões (Portugal) R_r = 4.10 - 6.25%
- Marcel Coal Mine (Upper Silesian Coal Basin, Poland), R_r = 0.7%
- Rymer Cones (Upper Silesian Coal Basin, Poland), R_r = 0.6%
- Starzykowiec (Upper Silesian Coal Basin, Poland), R_r = 0.6 – 0.7%

Cathegories of transformed organic matter in coal wastes:

1. **Altered particles :**
    a. Cracks and microfractures
    b. Oxidation rims (paler and darker in colour)
    c. Plasticised particles:
        i. particles with porosity connected with devolatilisation and particles with porosity connected with the original maceral structure
        ii. particles with plasticised edges
    d. Bands
    e. Particles paler in colour

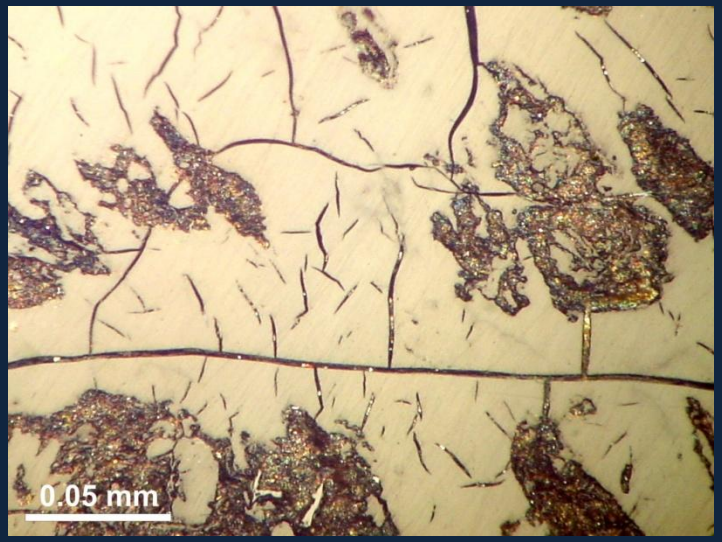
f. Coke (massive: isotropic, anisotropic; porous isotropic and anisotropic coke, and detritic coke)
g. Inertinite

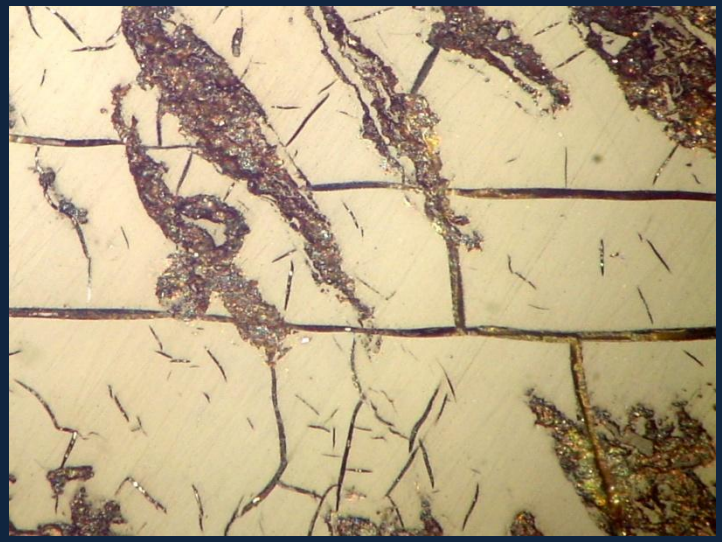
2. **Newly formed particles**
   a. Pyrolytic carbon
   b. Natural chars
   c. Bitumens
3. **Unaltered particles**

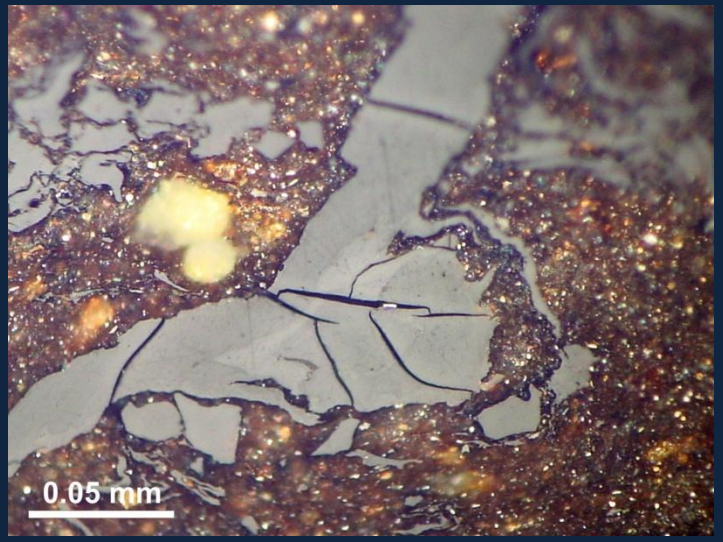
Problems with evaluation of results:

participants marked more than one form in the result sheet

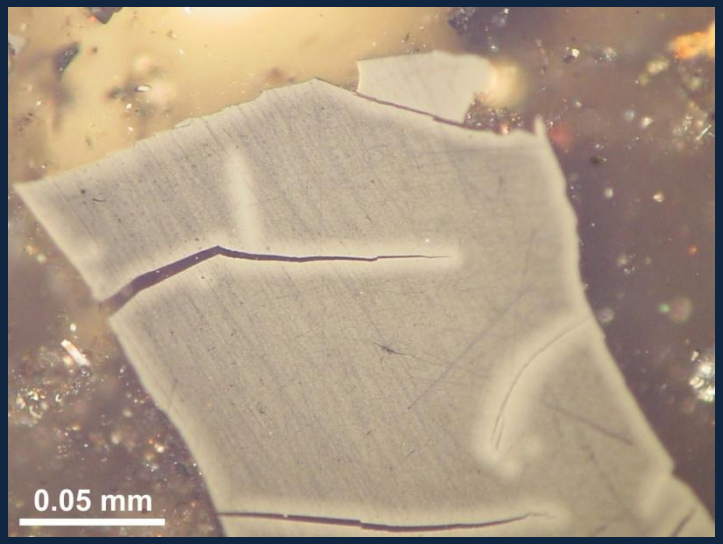
Particles with cracks and microfractures

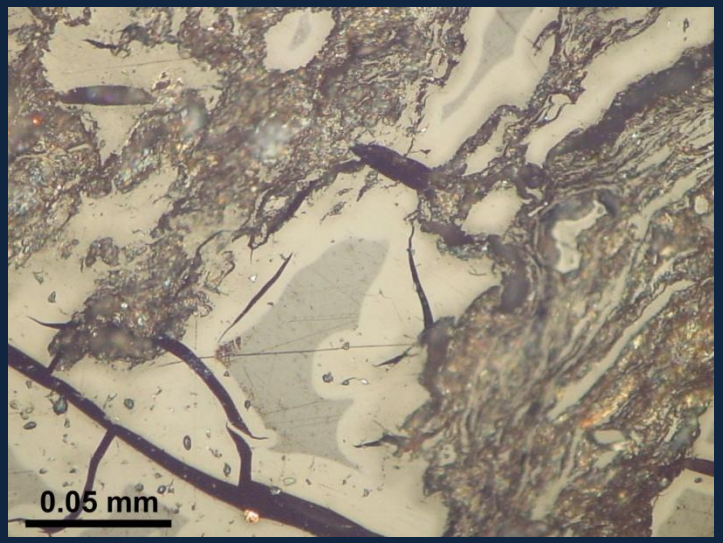


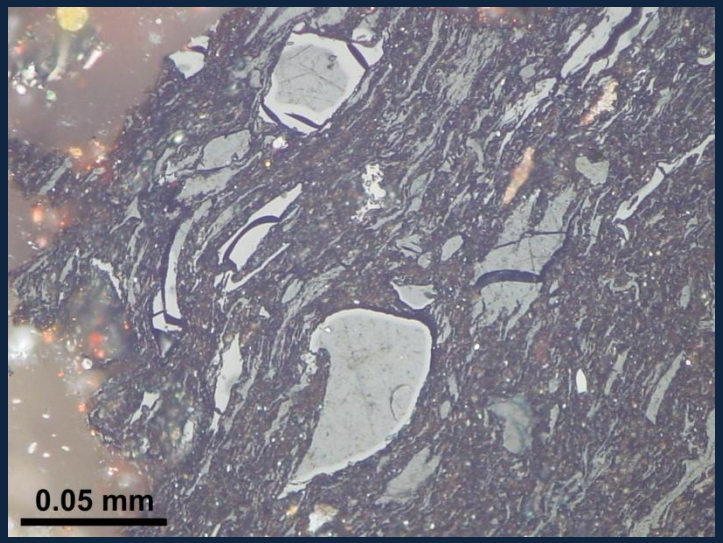




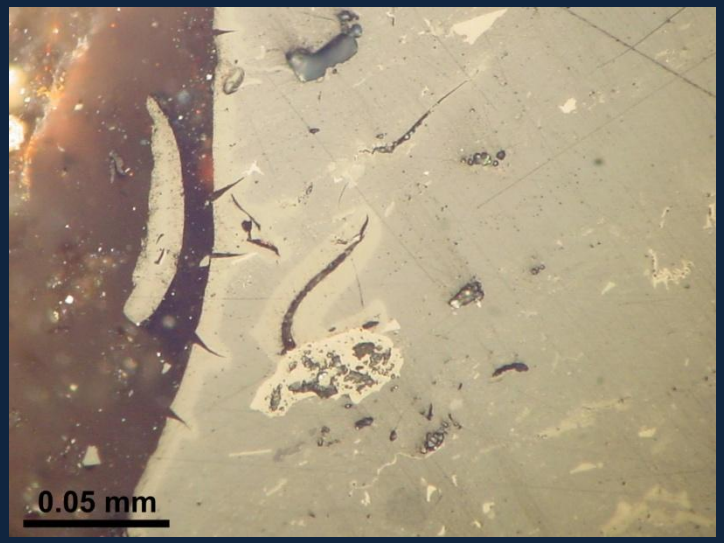
Lighter in colour oxidation rims

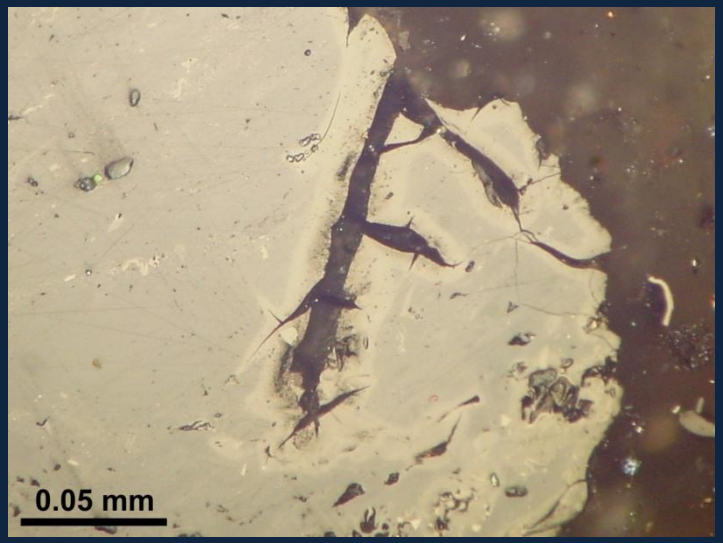




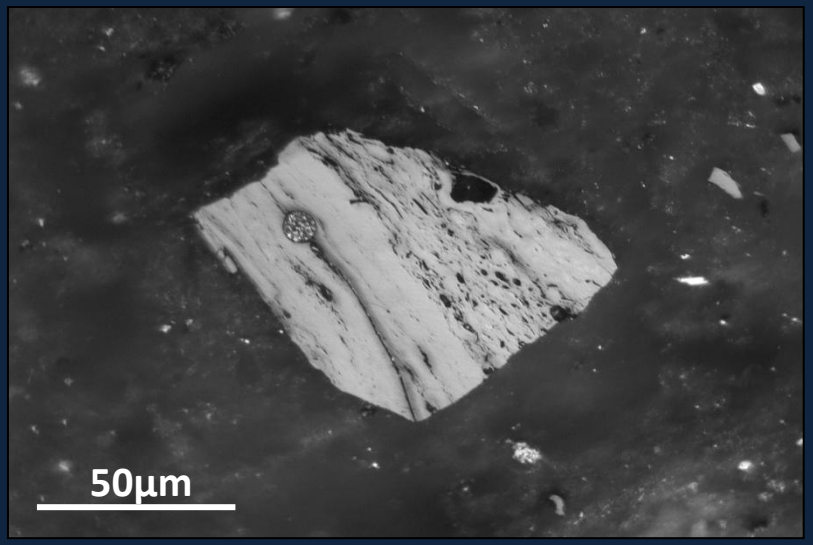


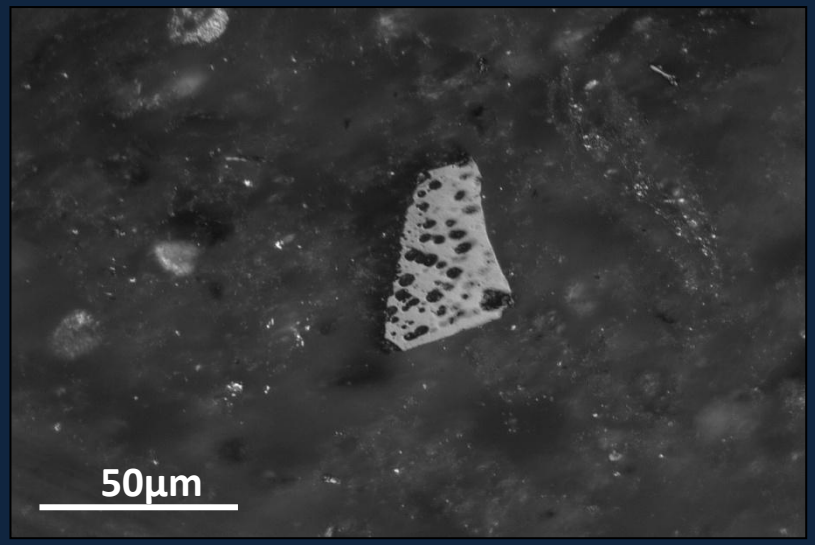
Lighter in colour oxidation rims and lighter in colour particles

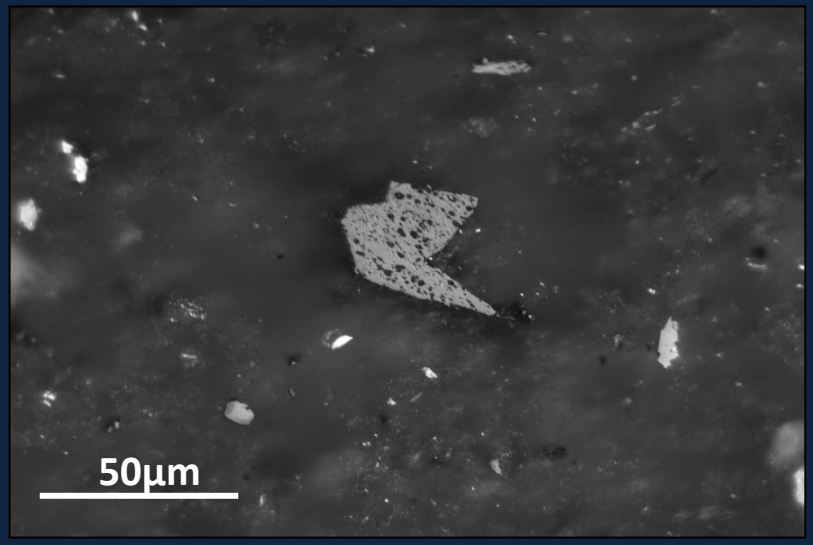




Particles with porosity



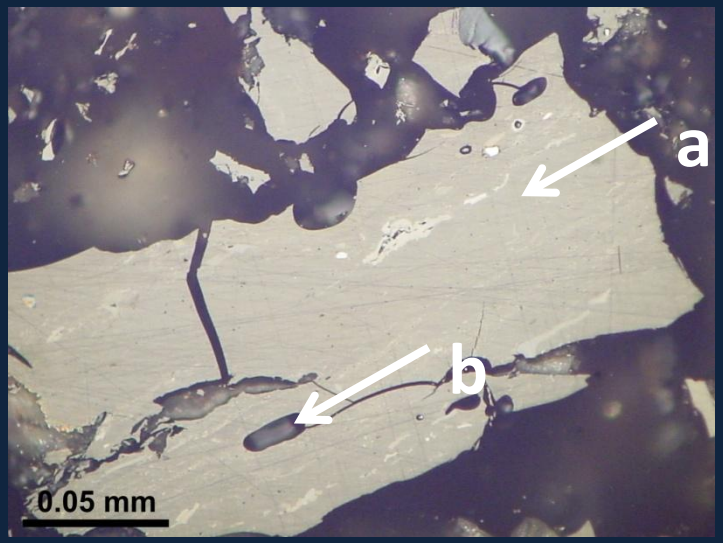




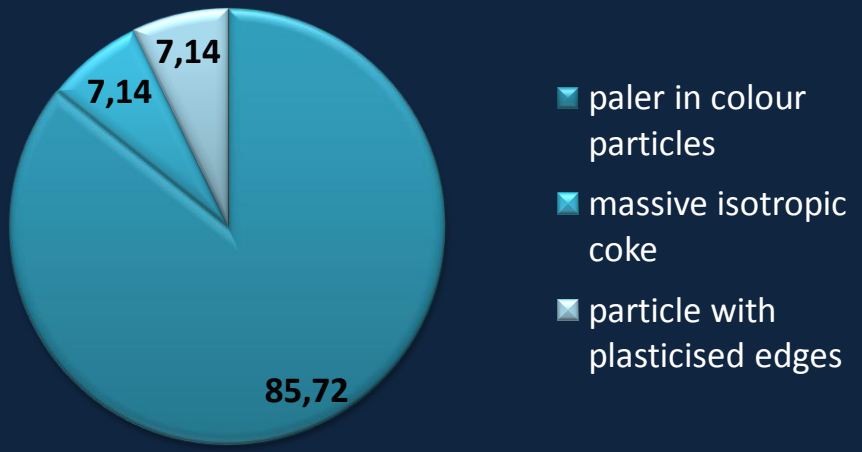
Coke - Organic particles paler in colour comparing to the parent organic matter; their colour is white or yellowish and they might show isotropy/anisotropy and porosity.

Massive isotropic coke - Organic particles not showing any porosity connected with devolatilisation; they form bands and lenses of various width; they are isotropic.

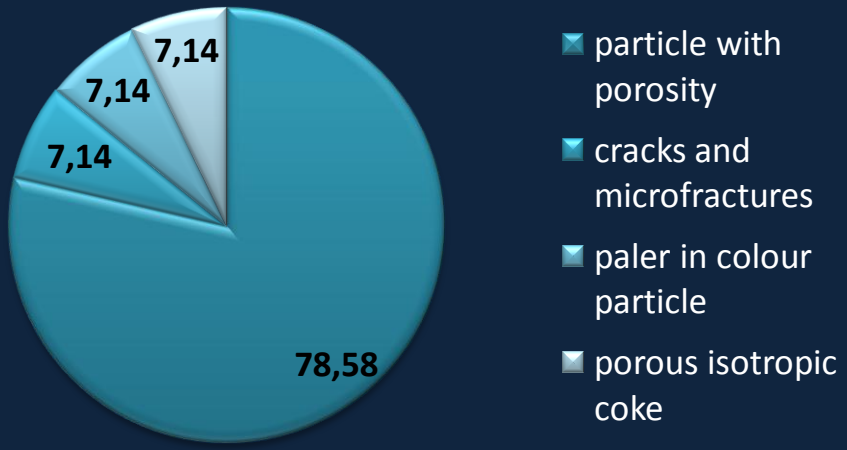
Paler in colour particles - Particles, commonly vitrinite, sometimes liptinite, that colour is paler and reflectance higher comparing to the parent coal.

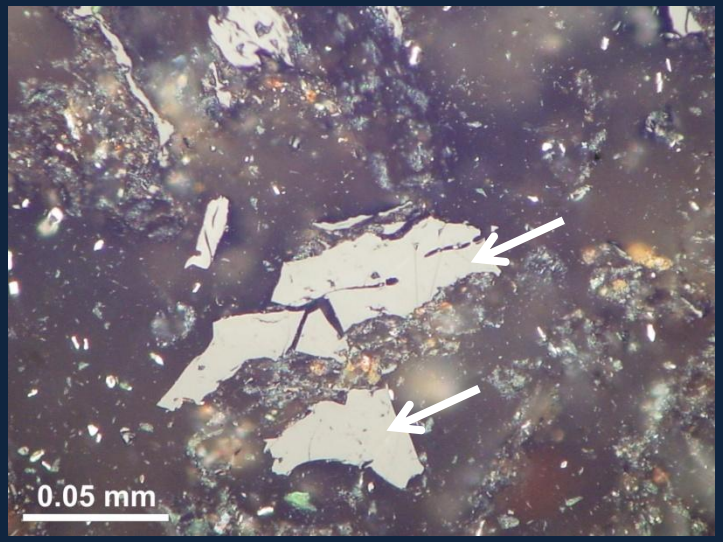

a
b
0.05 mm

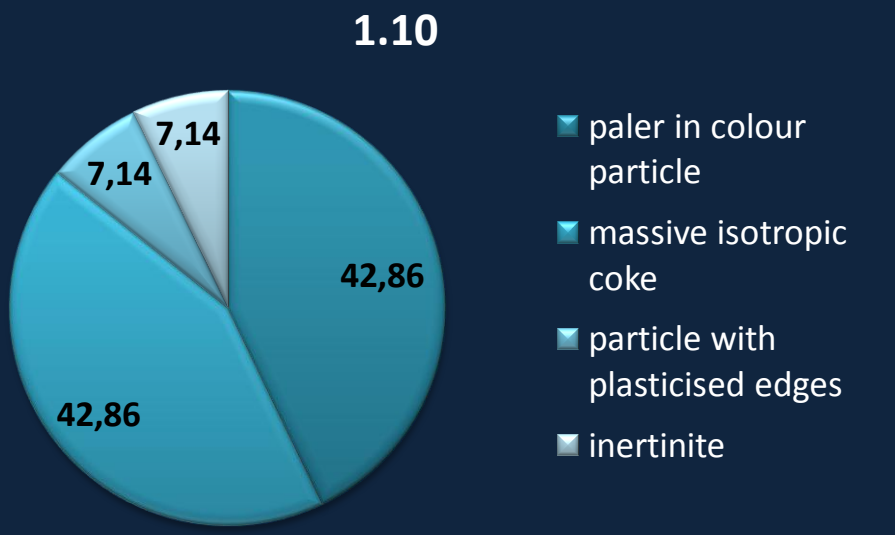
1.5a

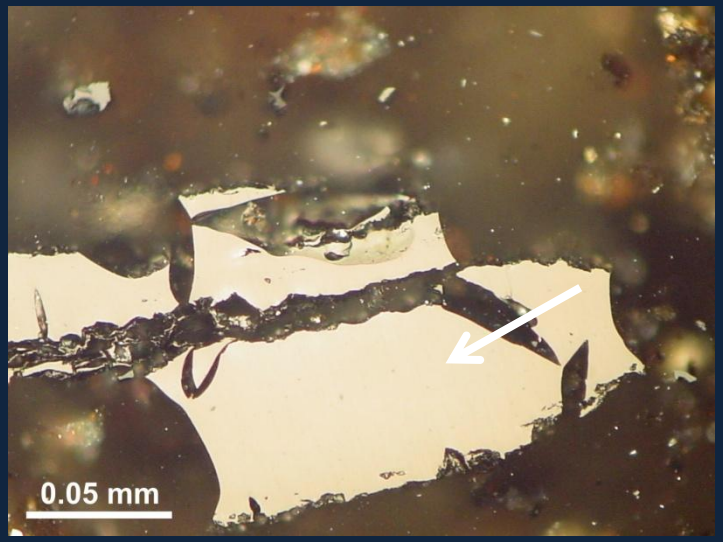

7,14
7,14
85,72
paler in colour particles
massive isotropic coke
particle with plasticised edges

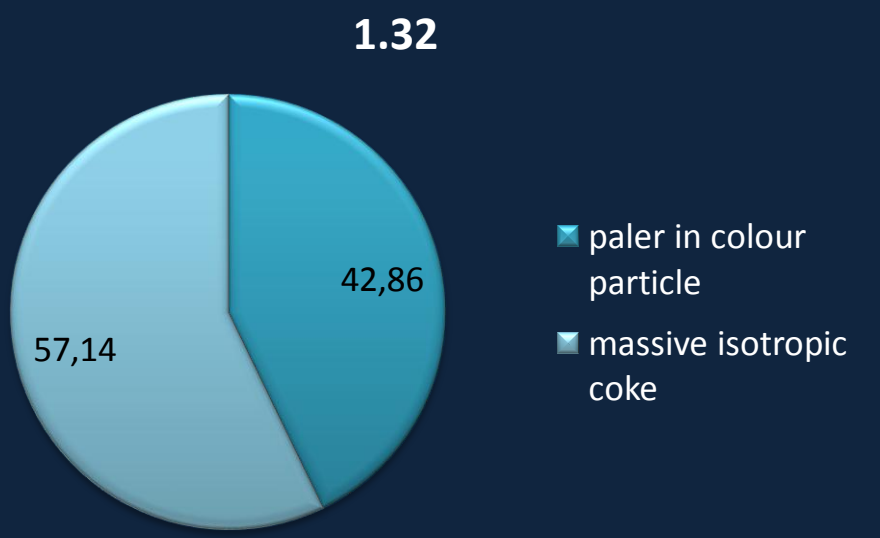
1.5b


7,14
7,14
7,14
78,58
particle with porosity
cracks and microfractures
paler in colour particle
porous isotropic coke

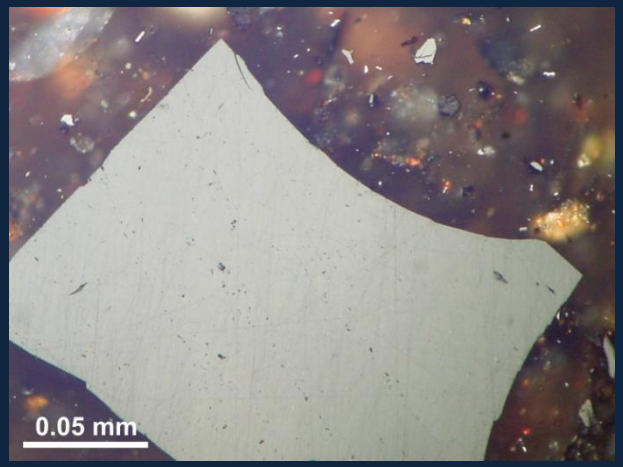

0.05 mm

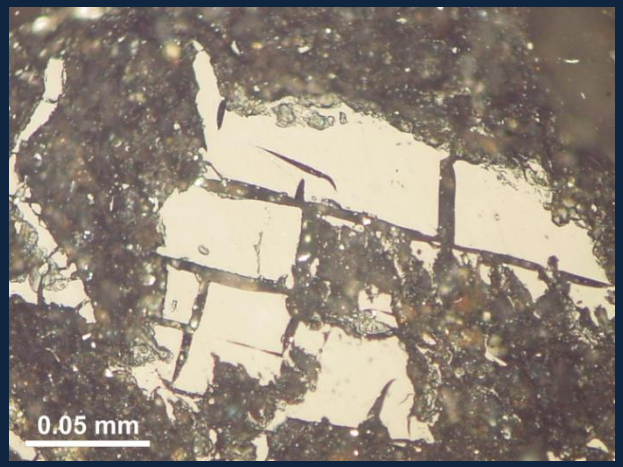

1.10
7,14
7,14
42,86
42,86
paler in colour particle
massive isotropic coke
particle with plasticised edges
inertinite

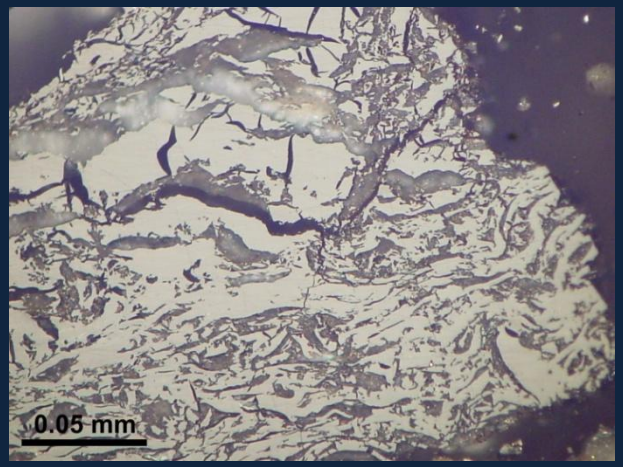

0.05 mm

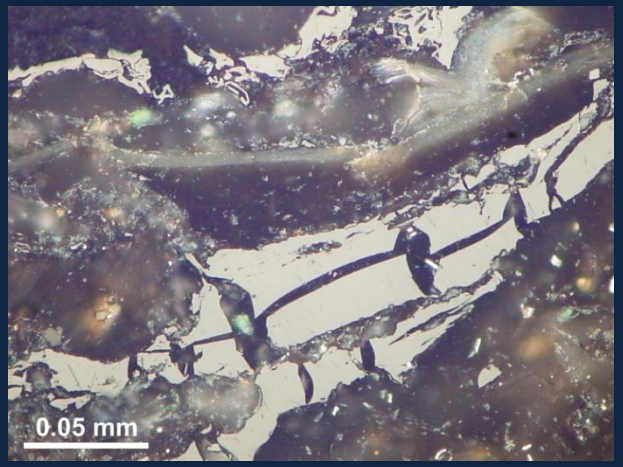

1.32
42,86
57,14
paler in colour particle
massive isotropic coke

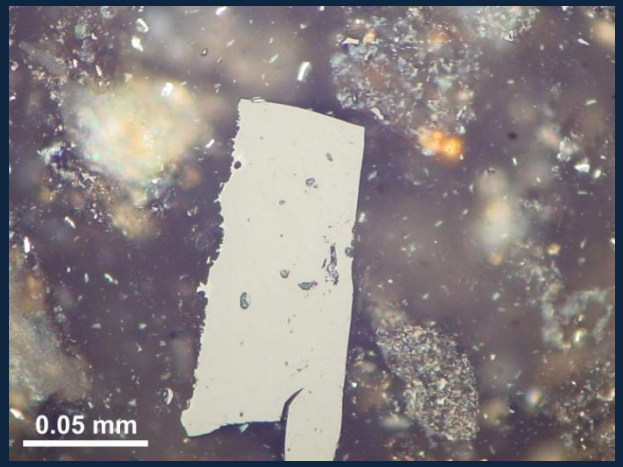
Paler in colour particles vs. massive isotropic coke





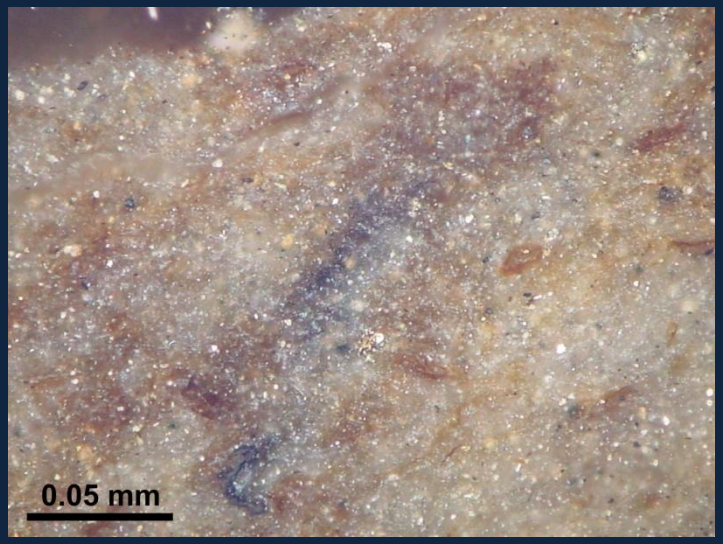


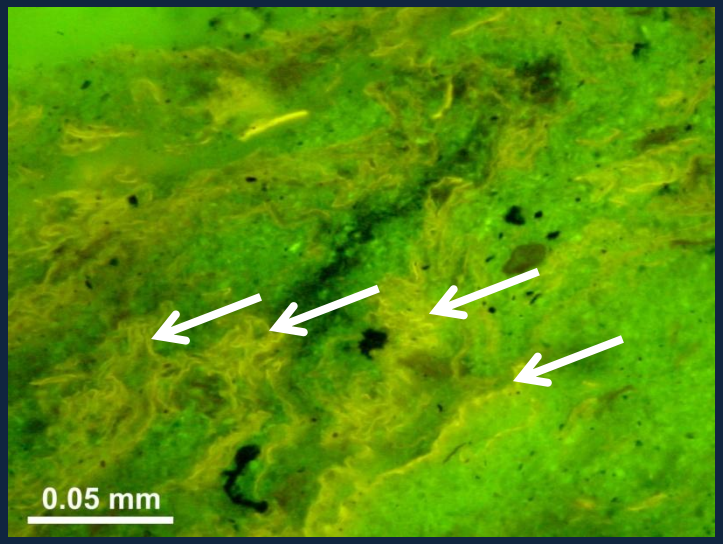




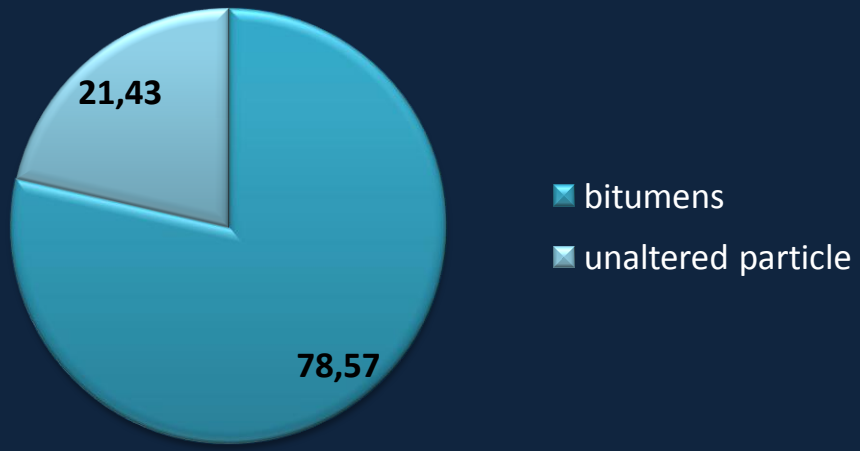
Bitumens (tar) - Expulsions of hydrocarbons generated during self-heating processes from liptinite macerals; they have various shape: droplets, threadlike structures or they are irregular; commonly they co-occur with minerals and have strong yellow fluorescence.

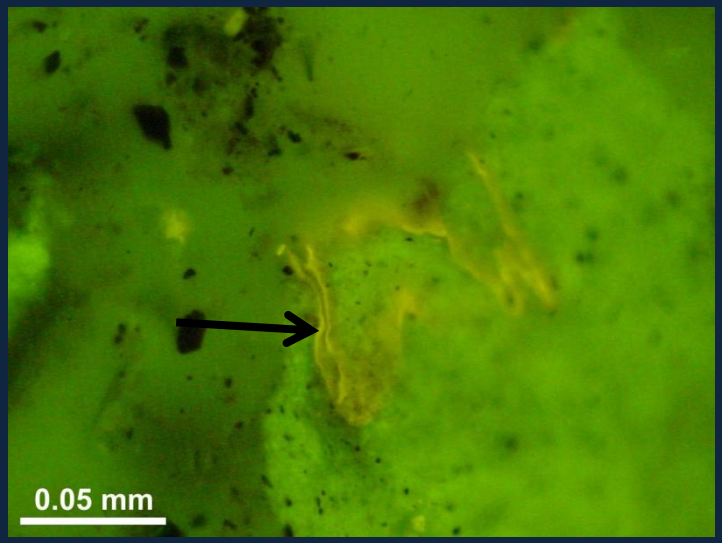
Unaltered particles - Macerals of vitrinite, liptinite and inertinite group that were not altered by self-heating processes.



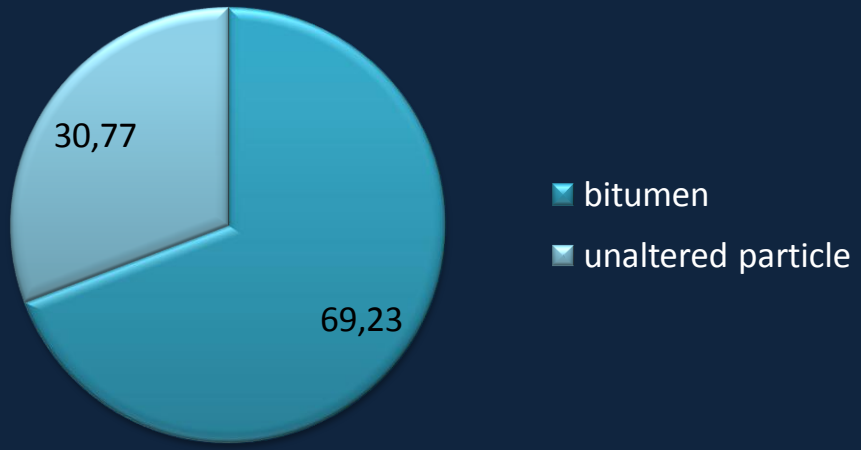


1.18



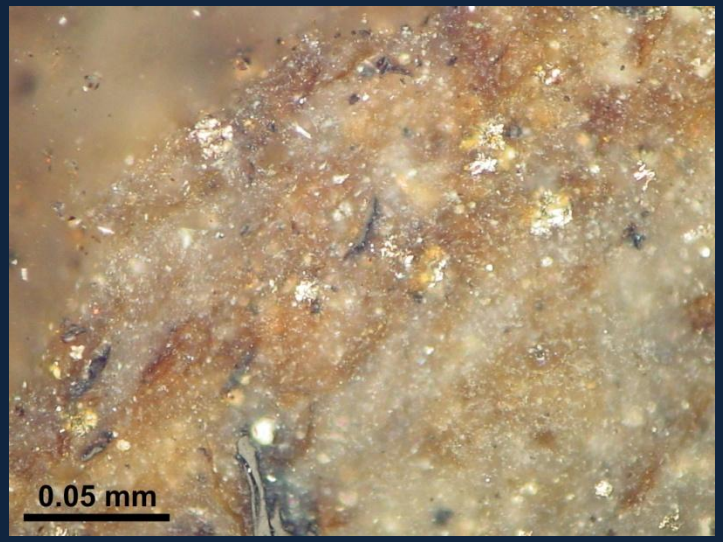


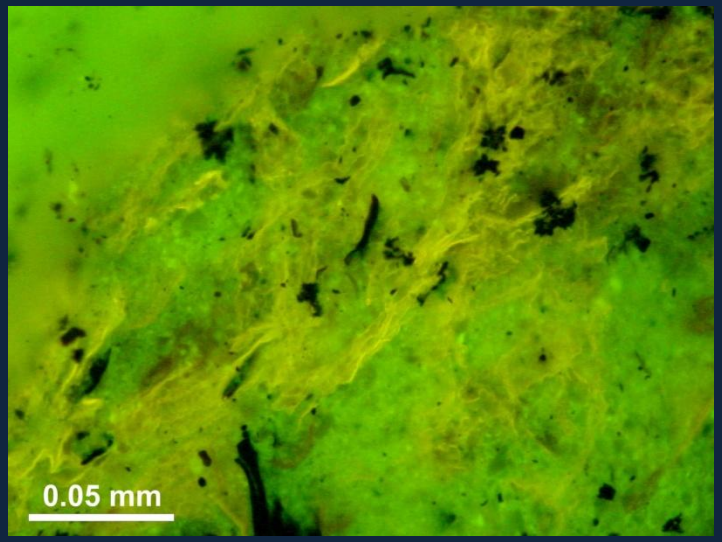
3.26



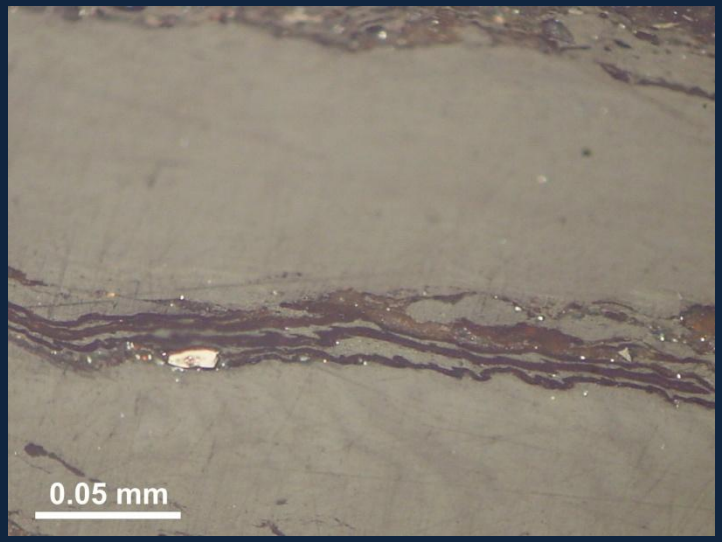
Bitumens vs. unaltered particle (liptinite)

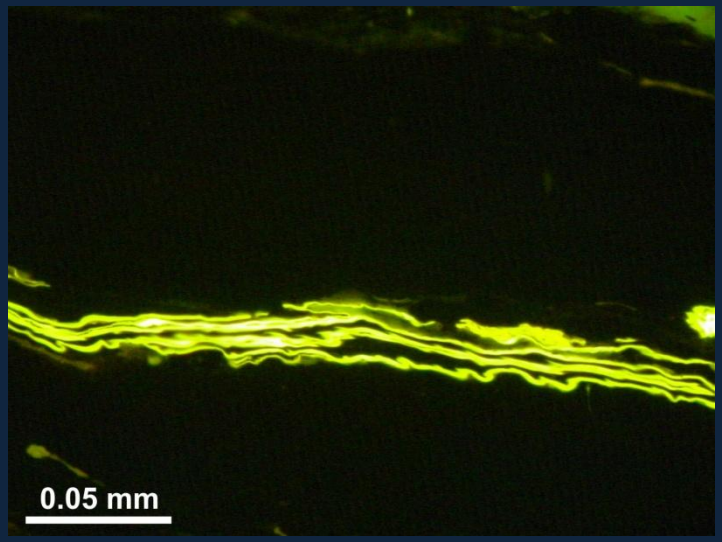
Not sure about my classification of this particle BUT with original materials whose reflectance is 0.7% + heat = material with strong and yellow fluorescence I have to classify this as bitumens

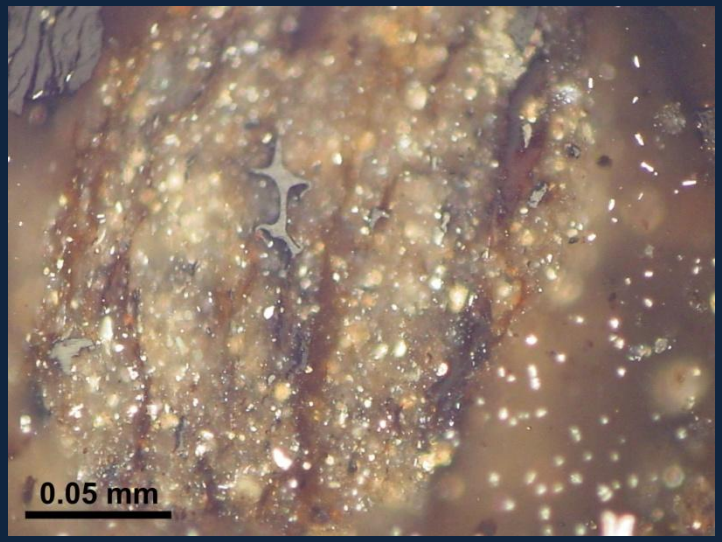


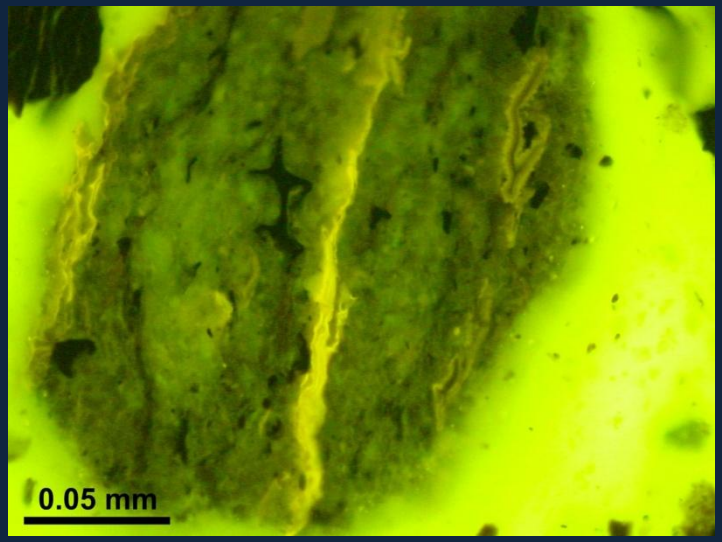


Bitumens vs. unaltered particle (liptinite)

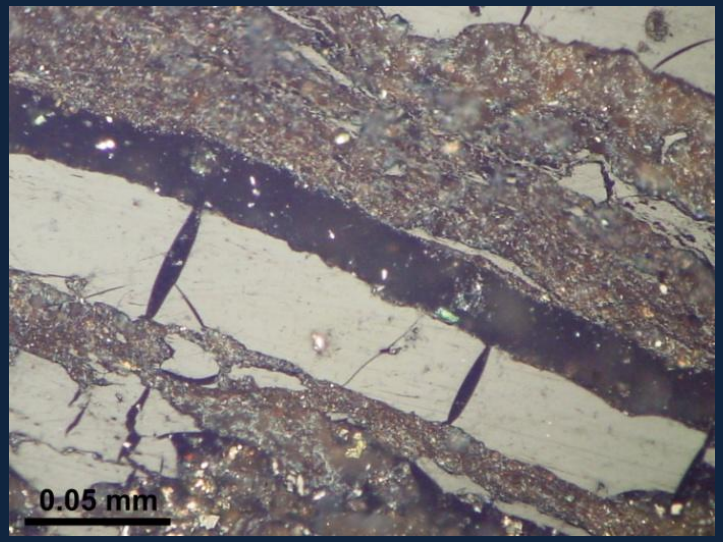


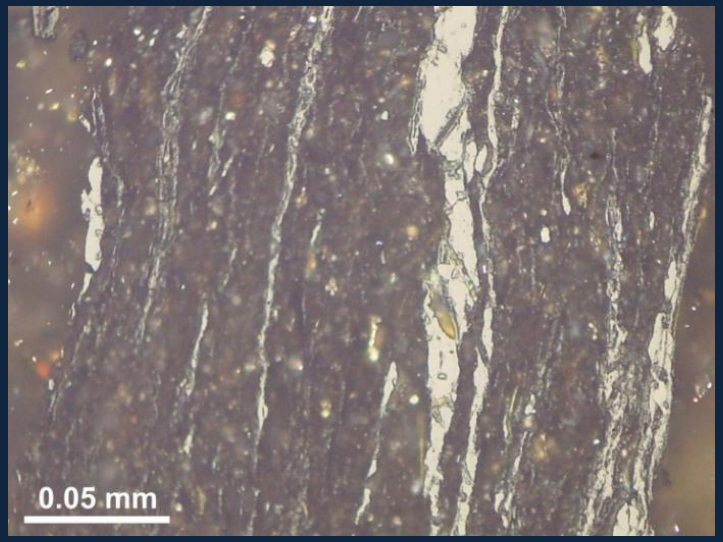


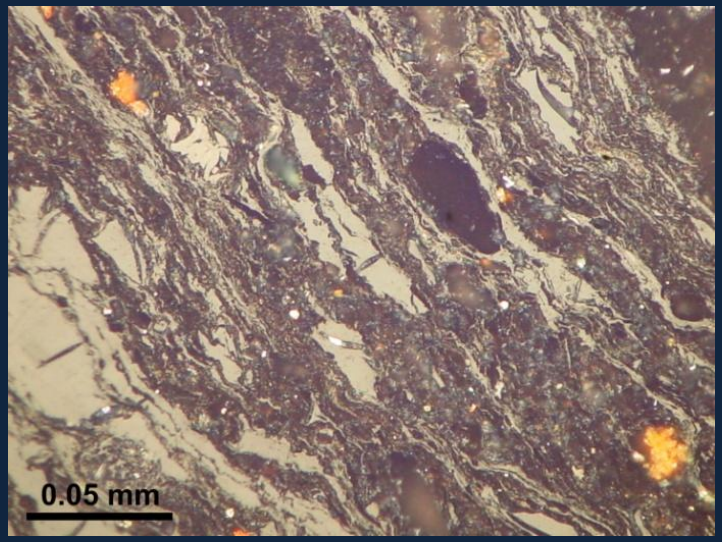


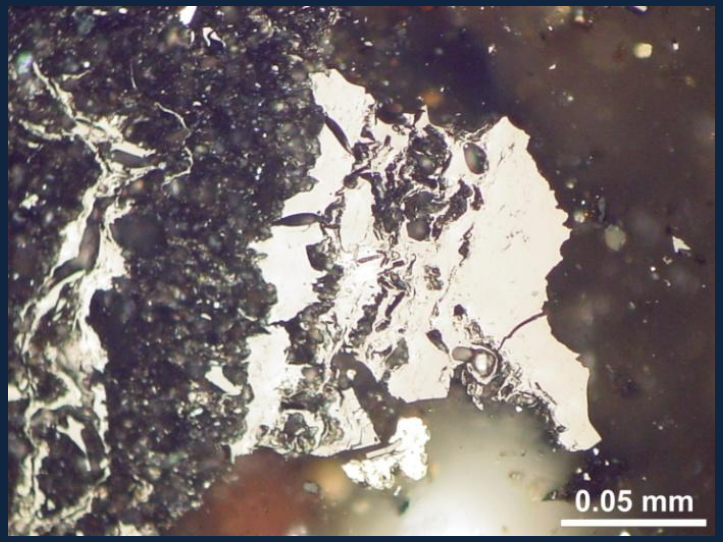


Paler in colour particle vs. detritic coke

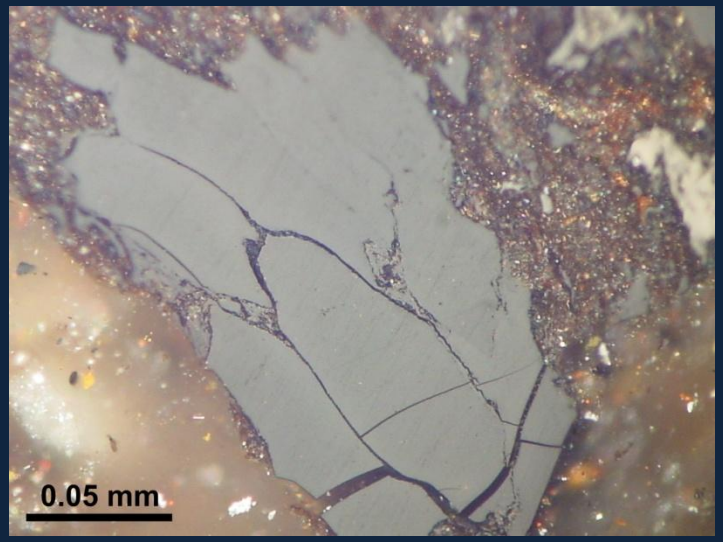


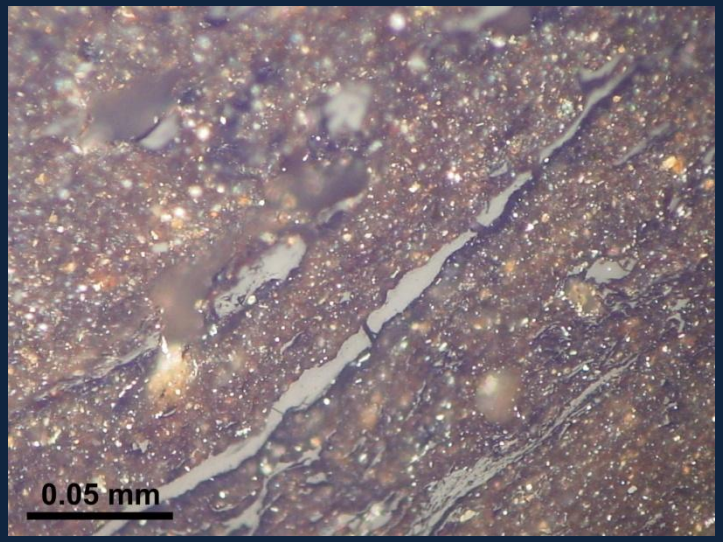


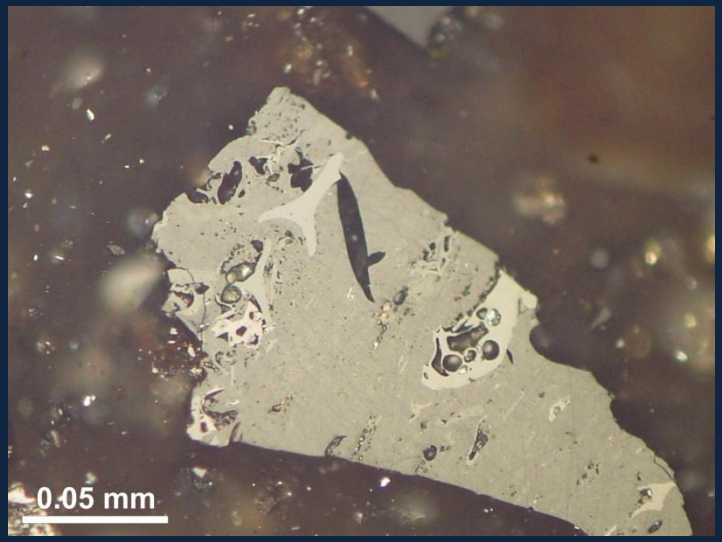




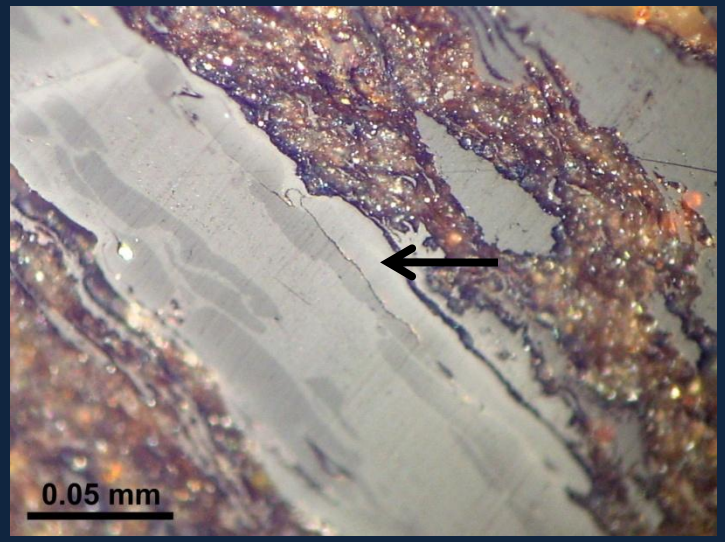
Paler in colour particle vs. unaltered particle

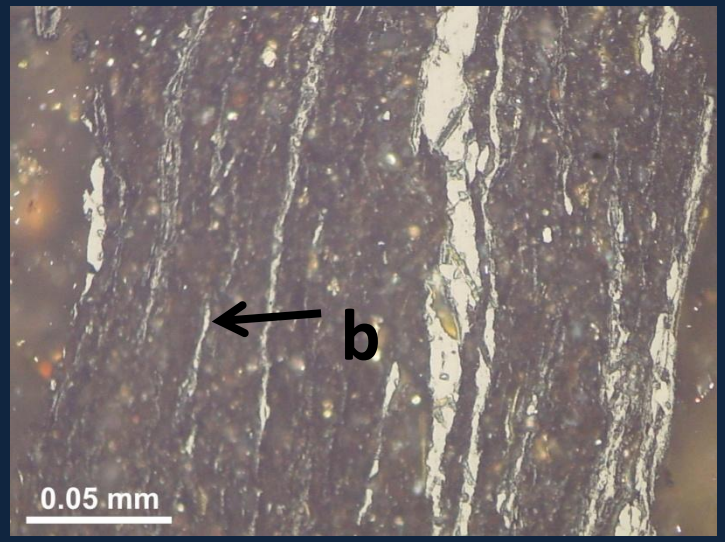


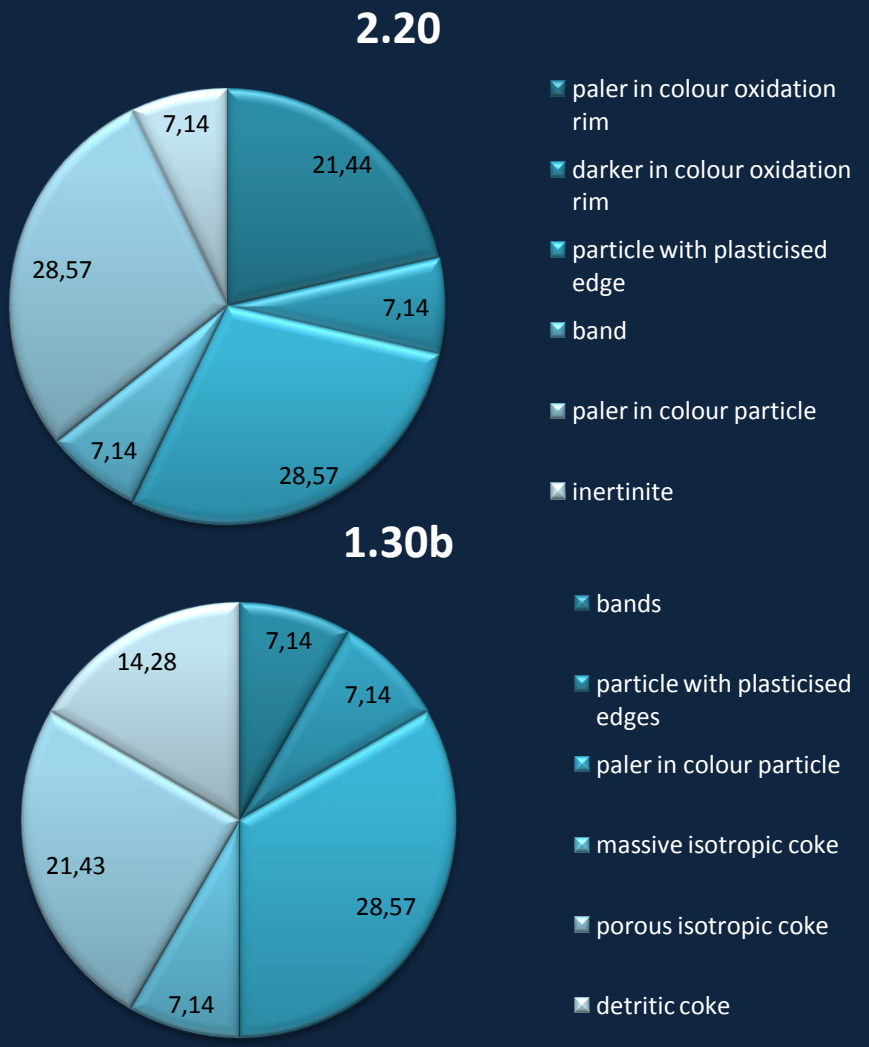




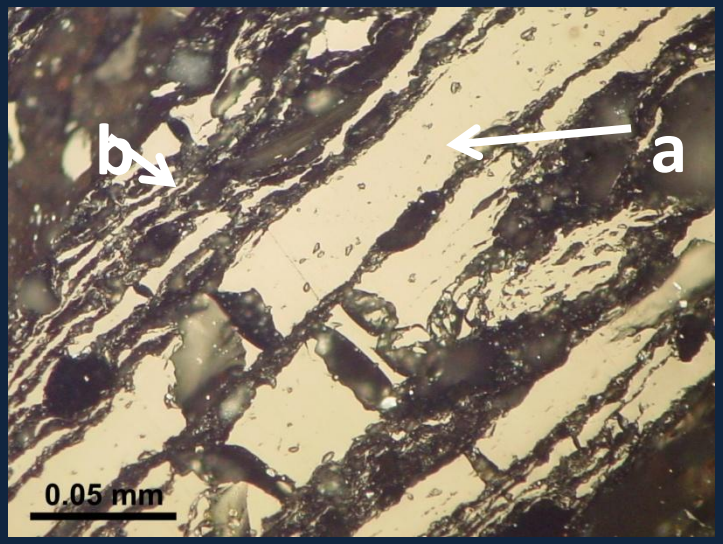
The most troublesom particles

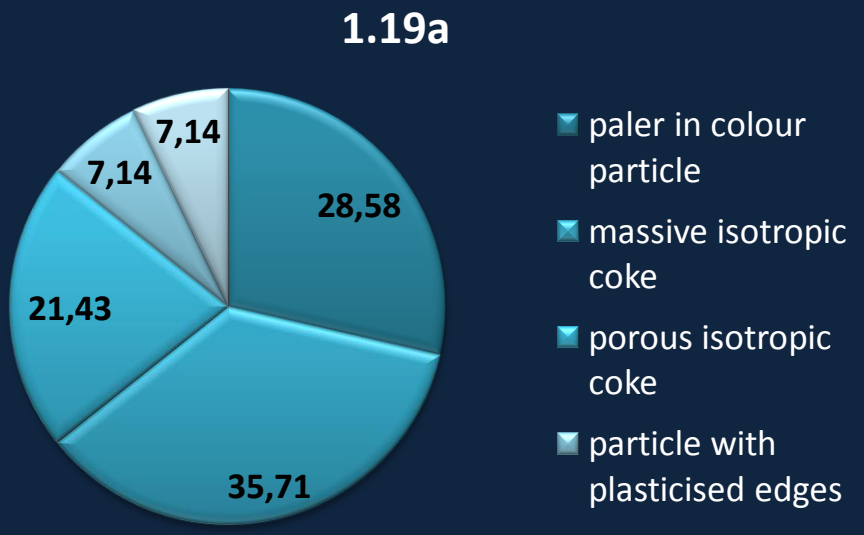


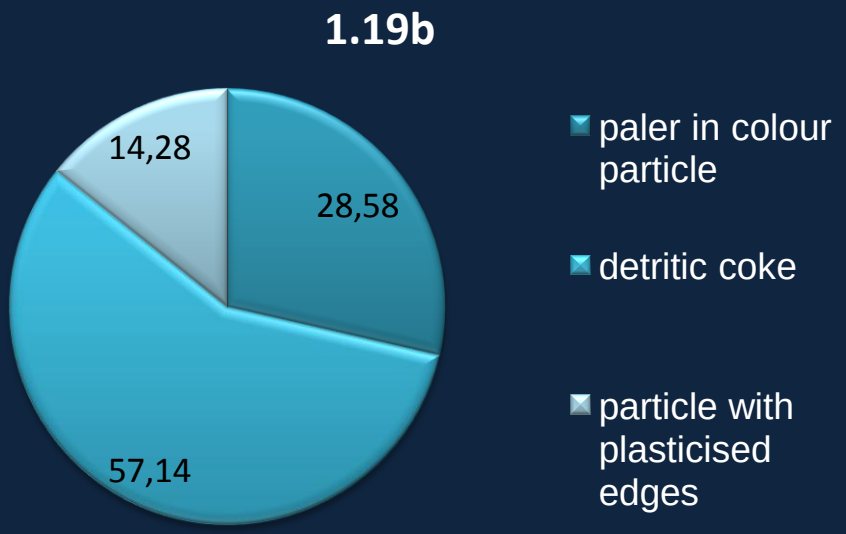




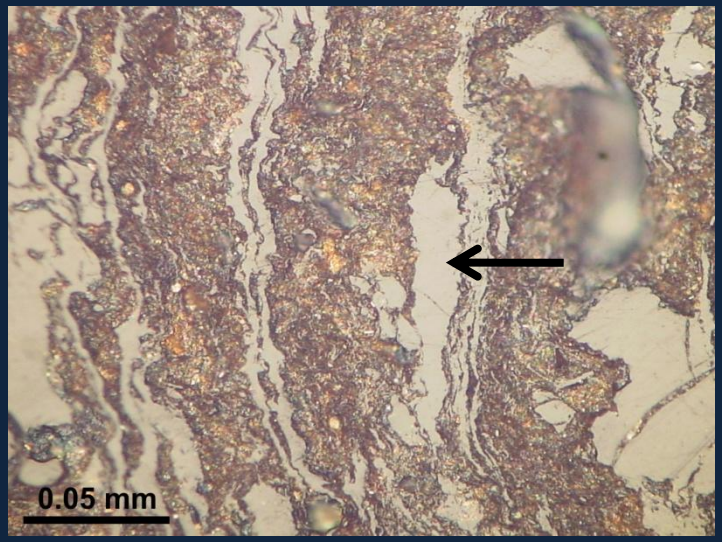
The most troublesom particles

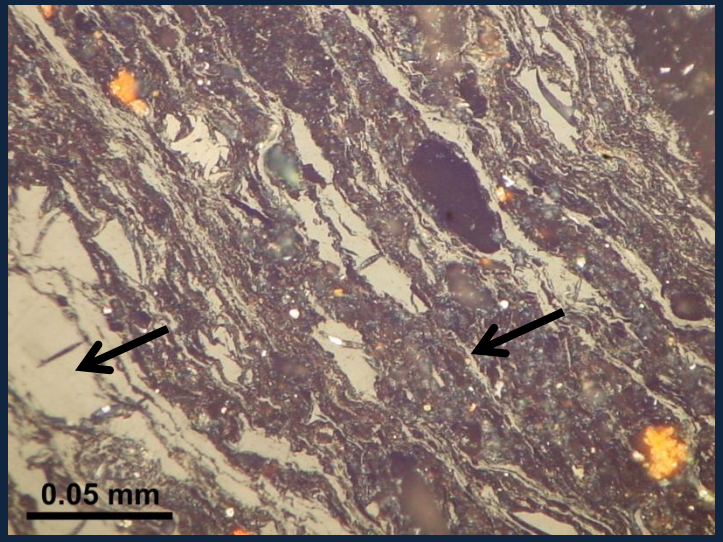


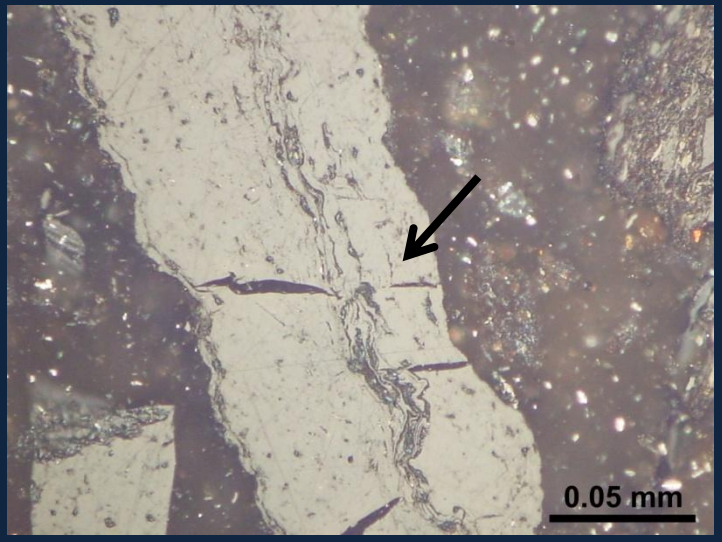




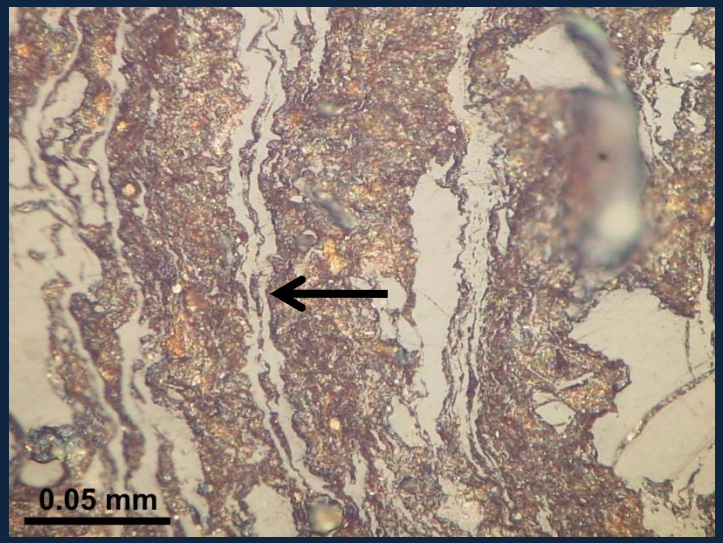
The most troublesom particles

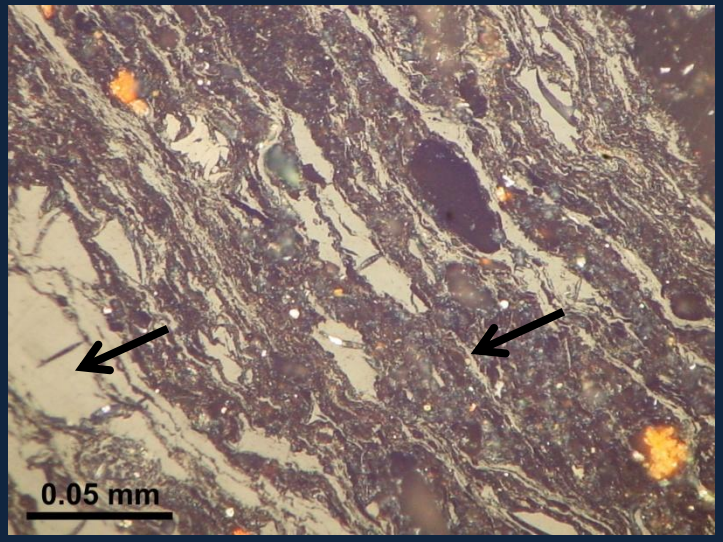


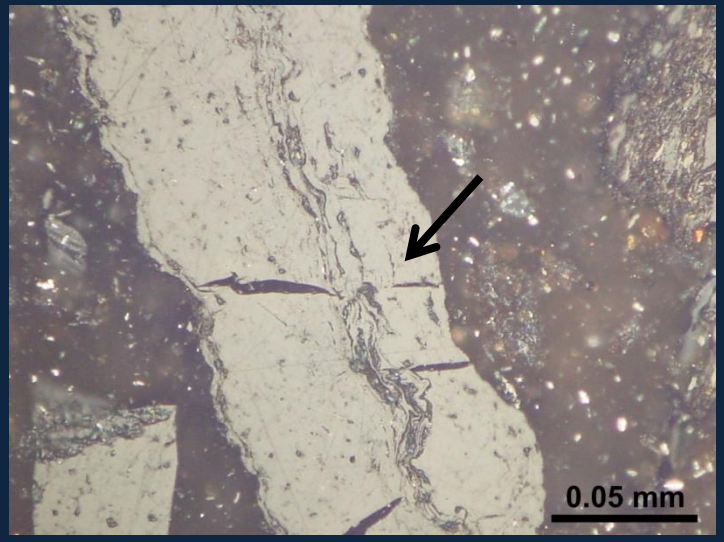




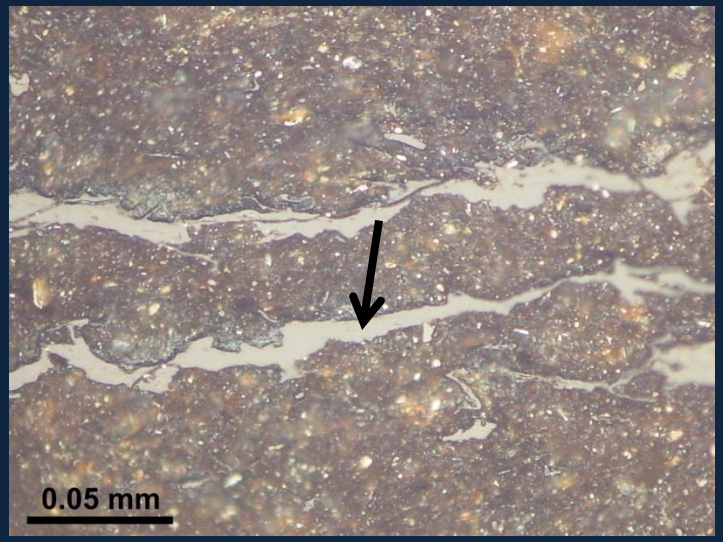
The most troublesom particles

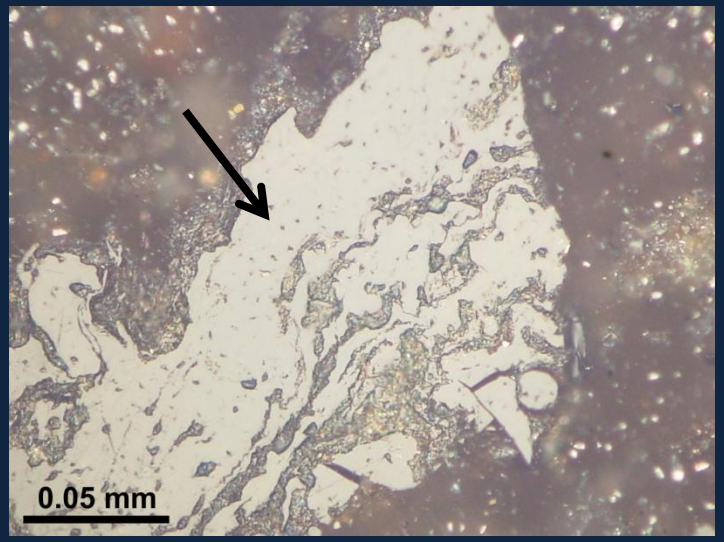


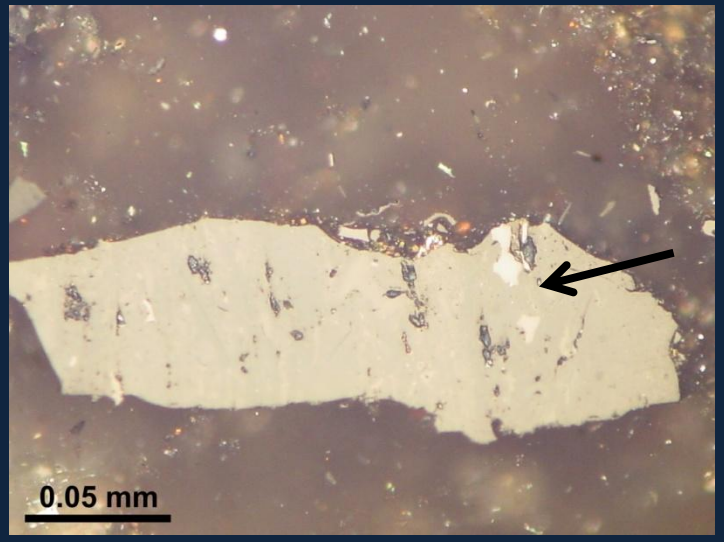




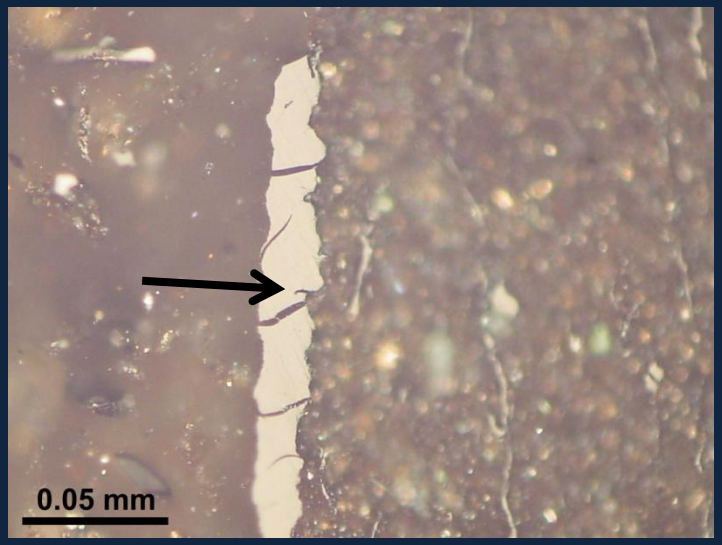
The most troublesom particles

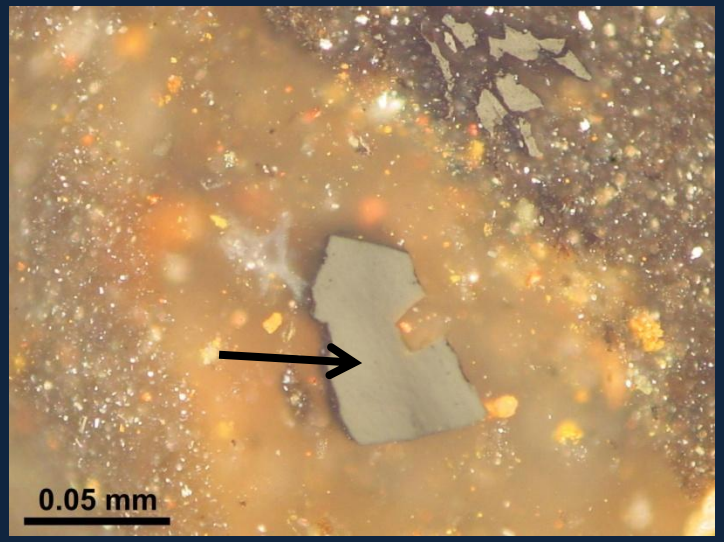


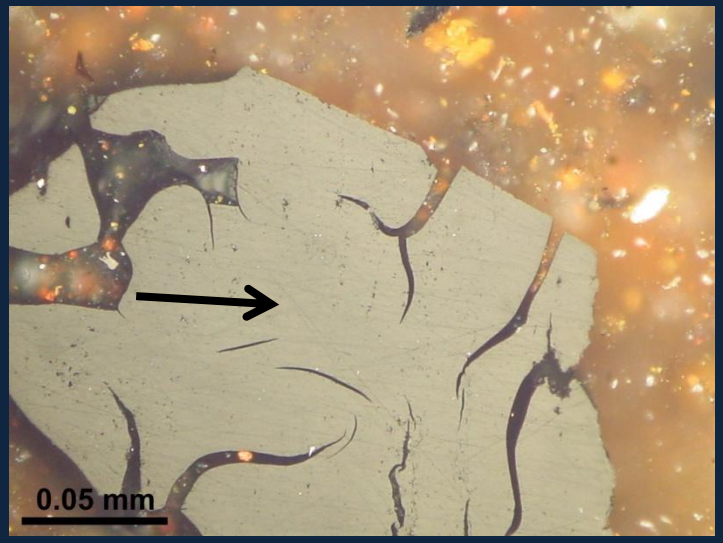


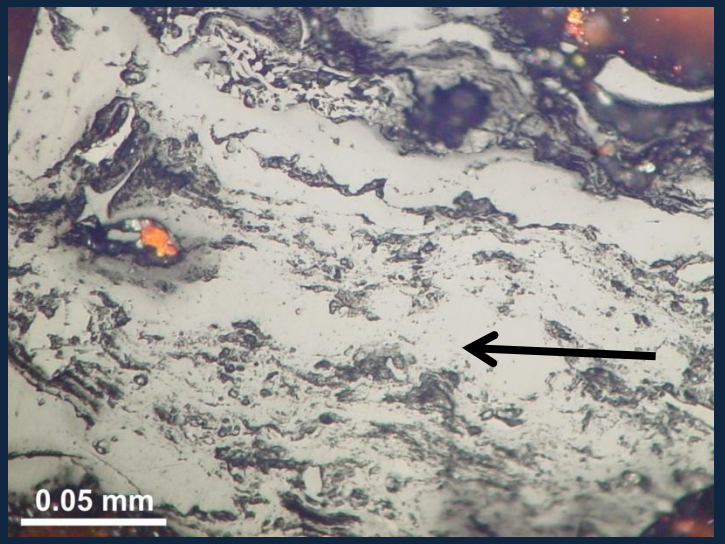


The most troublesom particles

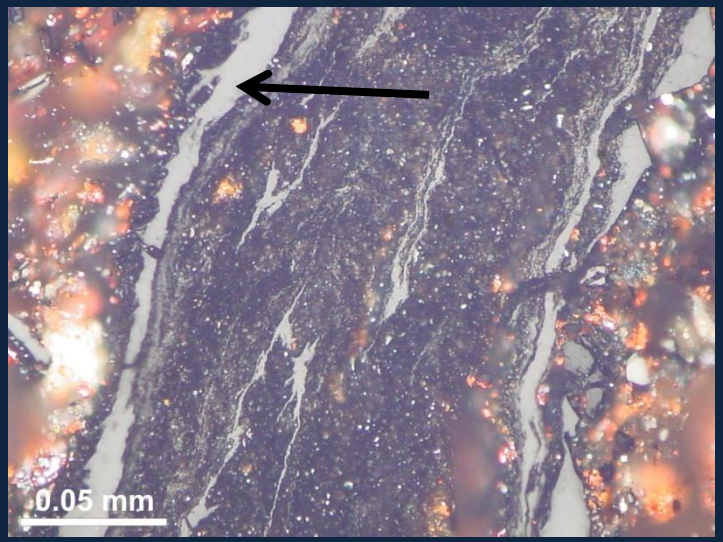


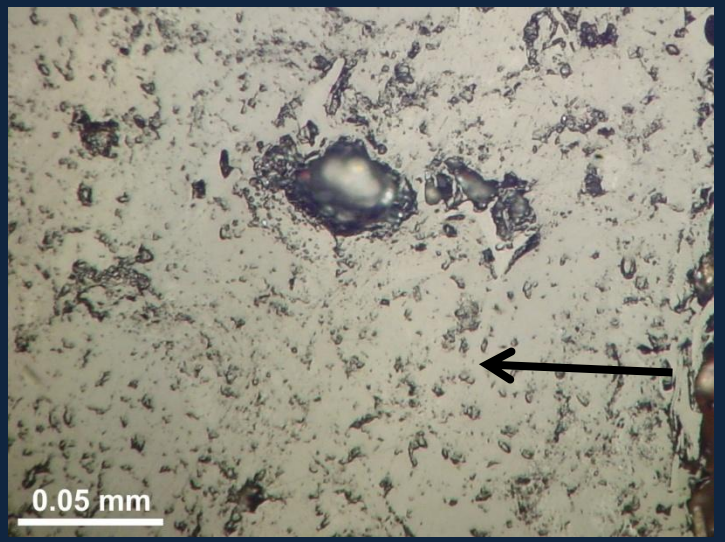


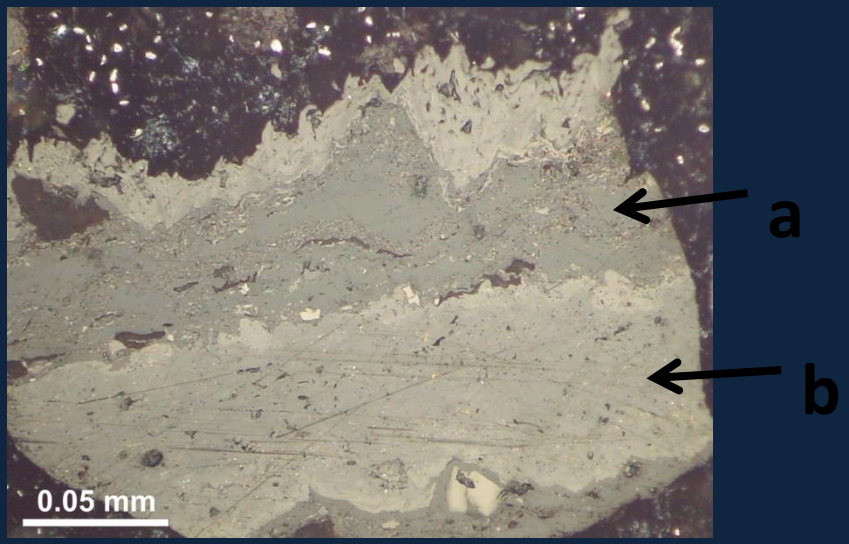




The most troublesom particles







Suggestions for future exercise:

- Use cross-hair instead of arrows
- Decrease the number of particles to recognize
- Include tar as a separate category
- Continue with classification of organic matter in coal wastes

The schedule for next exercise:

- the end of April 2011 – the deadline for sending microphotographs of organic matter altered in self-heating processes
- the end of June 2011 – preparation of next exercise
- August 31, 2011 – the deadline for sending results.