

Coke Microtexture Working Group

65th ICCP Meeting – Sosnowiec,
Poland

Working Group Convenor: Lauren Johnson

Presented By: Magdalena Misz-Kennan

Round Robin Participants

- A big thank you to the following people that participated in this years round robin:
 - Magdalena Misz-Kennan
 - Deolinda Flores
 - Paul Hackley
 - Isabel Suarez Ruiz
 - Lauren Johnson

Thank you to Magda who will be presenting this on my behalf today, I unfortunately could not make it to join you in Poland this year.

As this was my first year as the convenor of this working group my sincere thanks goes to Magda and Isabel for their guidance.

The round robin was sent out a little later than I would have liked this year as time seems to get away so quickly, and I therefore have to express gratitude that the participants were able to send their results in within a fairly short time frame.

Round Robin- Focus

- Classify the carbon forms in images of coke given a reference document with some photographs.

The main focus of this round robin was to determine if given a classification system analysts can reach agreement on the fused and unfused constituents, subsequently analysts were asked to classify the fused matrix using the instructions provided. However automated methods of coke classification are also of interest to the working group.

Round Robin- Outline

- A total of 20 Images from 4 Cokes (40 points)
- Samples: 4 Australian Coking Coals
- Samples were also sent to Dave Pearson for Coke Reflectance Measurements

Images of 20 fields view, 1 image no polariser and the other with polariser half crossed were distributed. Each Image was marked with cross hairs and there were forty points to classify in total.

Four Australian coke samples were used, the parent coals had a range of ranks to ensure that all carbon forms were present in the images.

The samples were also sent to Dave Pearson for Coke Reflectance measurements, as automated methods are also of interest to the working group.

Round Robin- Results

- Key Feedback f
- Overall I'm impressed with the agreement between operators (Obviously there is room for improvement)
- Good Agreement of Fused Matrix/ Unfused Inclusions
- For Carbon forms often choosing very similar classifications

Key Feed back from the participants was that the images were too dark, this was noted by the WG convenor and I will resolve this issue for next time.

Overall the agreement between operators is better than I expected, some of the participants do not routinely conduct coke microtextural analysis. The following four slides provide a summary of the results recorded, this allows us to determine what classifications are not easy to apply or cause problems.

Round Robin- Sample 1

Image Number	Cross Hair		
	A	B	C
1	2 x Lenticular Medium 1 x Lenticular Fine 1 x Lenticular Coarse 1 x Isotropic- Incipient Anisotropic	5 x Isotropic Unfused	
2	3 X Pore 2 x Mineral	3 x Anisotropic Unfused 1 x Isotropic Fused 1 x Circulr Coarse	3 x Isotropic inertinite 2 x Circular Fine
3	2 x Circular Medium 1 x Circular Coarse 1 x Incipient Anisotropic 1 x Lenticular Coarse		
4	2 x Circular Fine 1 x Incipient Anisotropic 1 x Lenticular Fine 1 x Isotropic Unfused	1 x Incipient Anisotropic 1 x Circular Fine 1 x Circular Medium 1 x Circular Coarse 1 x Lenticular Fine	
5	2 x Circular Medium 1 x Lenticular Medium 2 x Lenticular Coarse	2 x Circular Coarse 2 x Ribbon Medium 1 x Ribbon Coarse	

Round Robin- Sample 2

Image Number	Cross Hair		
	A	B	C
6	1 x Lenticular Medium 2 x Lenticular Coarse 1 x Ribbon Fine 1 x Ribbon Medium		
7	4 x Anisotropic Unfused 1 x Isotropic- Incipient Anisotropic	2x Isotropic Unfused 1 x Anisotropic Unfused 1 x Lenticular Coarse 1 x Ribbon Coarse	3 x Anisotropic Inertinite 1 x Isotropic Fused 1 x ?
8	1 x Circular Fine 1x Circular Medium 3 x Lenticular Medium	1x Lenticular Fine 1x Lenticular Medium 3x Lenticular Coarse	
9	1 x Lenticular Fine 4 x Lenticular Medium	1 x Isotropic Unfused 1 x Lenticular Coarse 2 x Ribbon Coarse 1 x ?	
10	1 x Incipient Anisotropic 1 x Lenticular Fine 3 x Lenticular Medium	3x Isotropic Unfused 1 x Anisotropic Unfused 1 x Lenticular Coarse	

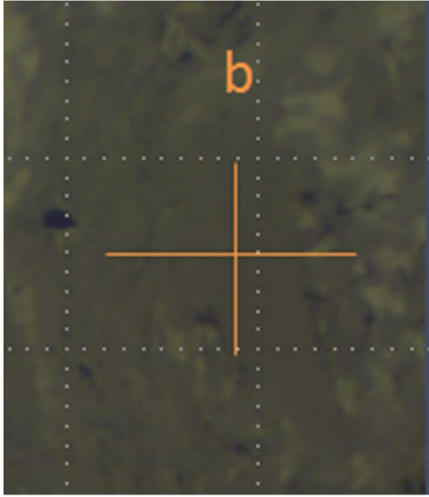
Round Robin- Sample 3

Image Number	Cross Hair		
	A	B	C
11	1x Circular Fine 1x Circular Medium 3x Circular Coarse	3x Isotropic Unfused 1 x Anisotropic Unfused 1 x Incipient Anisotropic	
12	1 x Incipient Anisotropic 1 x Isotropic Inertinite 1 x Pyrolytic Carbon 1 x Circular Coarse 1 x Lenticular Medium	1x Circular Coarse 2 x Circular Medium 1 x Circular Coarse 1x isotroi	
13	4 x Lenticular Coarse 1 x Ribbon Medium	5 x Isotropic Unfused	
14	1 x Incipient/ Circular Fine 1x Isotropic - Incipient 1 x Domain 1 x Circular Fine 1 x Circular Medium	4 x Lenticular Coarse 1 x Isotropic Fused	
15	1 x Incipient/ Circular Fine 2 x Circular Fine 1 x Circular Coarse 1 x Lenticular Fine	3 x Circular Fine 1 x Circular Coarse 1 x Lenticular Medium	

Round Robin- Sample 4

Image Number	Cross Hair		
	A	B	C
16	2 x Ribbon Medium 2 x Ribbon Coarse 1 x Isotropic	2 x Lenticular Medium 1 x Ribbon Fine 1 x Ribbon Coarse	
17	1 x Circular Coarse 2 x Lenticular Medium 2 x Isotropic	4 x Isotropic Unfused 1 x Anisotropic Unfused	
18	5 x Ribbon Coarse	1 x Isotropic- Incipient Anisotropic 1 x Anisotropic Unfused 1 x Circular Coarse 1 x Lenticular Coarse 1 x Ribbon Fine	
19	5 x Isotropic Unfused	2 x Ribbon Fine 1 x Ribbon Coarse 1 x Pyrolytic Carbon 1 x ?	
20	2 x Lenticular Medium 1 x Ribbon Fine 1 x Ribbon Medium 1 x Ribbon Coarse	1 x Lenticular Medium 1 x Lenticular Coarse 1 x Ribbon Fine 2 x Ribbon Coarse	

What was agreed upon



Sample 1 Image 1- Isotropic Unfused



Sample 4 Image 19 - Isotropic Unfused

There was relatively good agreement on distinguishing unfused inclusions within the sample. For these two points all analysts agreed.

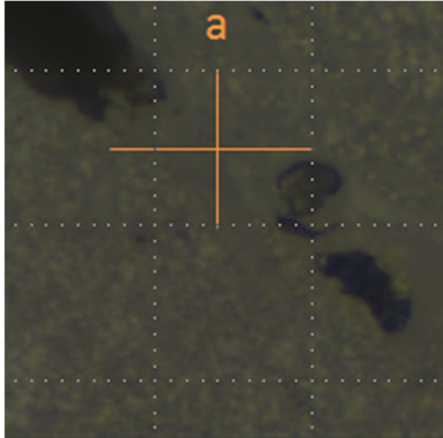
What was close to agreement



Sample 2 Image 9- 4 x Lenticular
Medium 1 x Lenticular Fine

There were also some areas where the analysts were close to agreement. In the left panel (sample 2, image 9 ,point a) 4 analysts classified the sample the same way, the other analyst classified the sample in the next closest category the differentiation between these two categories is based on the dimensions of the domain.

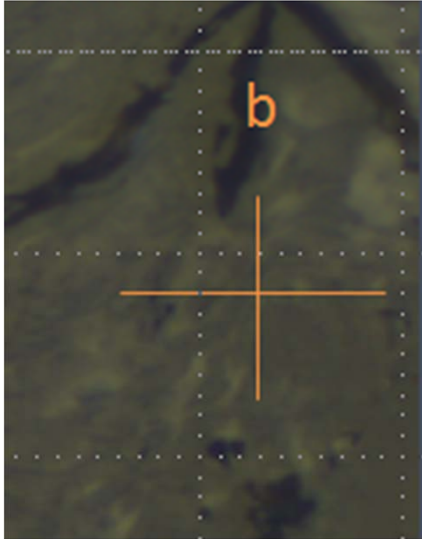
What was not agreed upon



Sample 3 Image 12 –
1 x Incipient Anisotropic
1 x Isotropic Unfused
1 x Pyrolytic Carbon
1 x Circular Coarse
1 x Lenticular Medium

There were then other points where each analyst had a different response there could be various reasons for this other than the less than optimal image quality for example: poor placement of the cross hairs, this could be resolved by use of a box to indicate the area to be classified.

What was not agreed upon



Sample 1 Image 4 –
1 x Incipient Anisotropic
1 x Circular Fine
1 x Circular Medium
1 x Circular Coarse
1 x Lenticular Fine

In this case all analysts classified the point differently but these classifications are close together, perhaps this could be helped by being able to measure the dimensions of the sample more accurately.

Where to now?

- The quality of the photos in this exercise have made things more difficult.
- Proposed Extension to this exercise using better photographs and a prepared sample.
- How do coke microtextures fit in with coke reflectance ? Work with Dave Pearson (and others) perhaps some joint exercises

Obviously the success of this exercise was limited based on the image quality which was made worse by the fact that images were sent as a PDF to reduce the file size. Therefore for the next twelve months I would suggest that new photomicrographs are taken and the areas to classify are not ambiguous.

As there seems to be an issue with measurement of fused domains I think that having a sample block to look at down the microscope will be of assistance.

We can then also ask participants to take photo micrographs of what they consider the various constituents of the coke, with the intention that this would raise some spirited discussion!

As I know that coke reflectance is of interest to many I think that there is an opportunity to work together with Dave Pearson and others if they are willing.

Coke WG Contact Details

- If you have further thoughts or would like to join the working group please contact:

Lauren Johnson

Lauren.johnson@alsglobal.com

Ph:+61 7 3713 8400