**Report on Self-Heating Working Group 2014**

Self-Heating Working Group was established during the 60th ICCP meeting in Oviedo in 2008 and the aim of the group was to establish a classification of transformed organic matter in coal (coal seam and coal heaps) and coal wastes that underwent self-heating processes. The information about establishing our working group was published in ICCP News Letter No. 45, 2008. Through all the years the Self-heating WG was active and we have carried out three Round Robin Exercises. In 2011, the material for discussion on various forms of thermally altered organic matter in coal wastes was prepared and discussed during the ICCP Meeting in Porto. It has to be reminded that during the 61st ICCP meeting in Gramado in 2009 it was decided that separate classifications have to be prepared for coal wastes dumps and coal heaps/seams.

The aim of this working group is to establish a classification of transformed organic particles in coal wastes that will reflect the conditions in the coal waste dumps. It is a very demanding task due to a number of factors, both internal (maceral composition and rank of organic matter) and external (heating history mostly heating rate, end temperature and time, access of air (the direction and strength of wind) and moisture (atmospheric precipitation)) which influence it.

The past activity:

* The SHWG was established during the 62nd ICCP Meeting in Oviedo (2008) and information about it was published in the ICCP News Letter No. 45, 2008.
* Four Round Robin Exercises were carried out in 2009, 2010, 2012 and 2013.
* Discussion on the established terminology took place during the 63rd ICCP Meeting in Porto in 2011.
* Discussion on HOW to present the form that has to recognized took place during the 64th ICCP Meeting in Beijing in 2012 and by e-mails after the meeting. The discussion continued during the ICCP Meeting in 2013.
* In 2014 there was no new Round Robin Exercise. I can only blame myself as I was very busy dealing with paper to the Special Volume of International Journal of Coal Geology that is prepared after our last meeting in Poland and updating the Commission III web page.
* For the purposes of this Working Group, Peter Crosdale sent us samples of coal that underwent self-heating experiments in Australia. Polished blocks were prepared from these coals but the coals were only slightly altered and for that reason not suitable for the SHWG Round Robin Exercise.

During previous meetings we agreed with the proposed classification of the organic particles and that reflectance is helpful in classifying the organic forms. The problem still is **HOW** to present the forms. There was no general consensus how to present the forms in the exercise. Some participants stated that we should use square, some that arrow or cross hair, and some that:

1. An arrow for specific forms to be classified (e.g. devolatilization vacuoles, microfractures, cracks,...)  
2. A square to the forms that need to be classified considering the whole particle (e.g. paler and darker in colour particle). If square, than what should be the dimensions of such square.

To classify the form of organic matter are using the following classification accepted during our previous meetings:

1. Unaltered particles - macerals of vitrinite, liptinite and inertinite group that were optically not altered by self-heating processes
2. Altered particles – particles that were altered to various degree during self-heating; this group was further divided with regard to:
   1. Appearance: cracked and microfractured, oxidation rims (paler and darker in colour), plasticized edges, bands, relatively paler colour and of which reflectance is higher that of unaltered particles
   2. Structure: massive, devolatilization pores
   3. Texture: isotropic, anisotropic
3. Newly formed particles – particles that formed during self-heating processes:
   1. Pyrolytic carbon
   2. Bitumens

Most of participants think that our classification should not be changed. However in the light of discussion on how should we present the form that has to recognized one participant had very good comments that let me quote here (from Stavros):

The problem with the current classification particularly in the categories “Appearance” and “Structure” is that they are a bit descriptive and not prescriptive,(prescriptive as quantified, e.g. the char classification (e.g. Bailey et al 1990, in Fuel vol. 69).

Therefore, this descriptive mode is making the point under observation (cross hair or arrow) to be of importance.

If we have some categorization based on vol - % of the “Appearance” or “Structure” categories then we could be able to apply these % on the “particle” level.

e.g. a particle that has a 5% of an oxidation rim, but the cross hair is on the unaltered part, still will be classified as “altered particle with an oxidation rim”.

For cracks and microfractures a “frequency criteria” could be established, e.g. number of cracks-fractures per dimension (and perhaps for this the use of a “square” would be more appropriate).

And definitely will be good to define “quantitatively” what “massive” and “devolatilization pores” denotes. (Perhaps introducing a similar categorization as per Bailey et al., 1990??).

Finally, I think that the classification should be open to the “right” to the “Maceral terminology” as well as to the “Char Terminology”.

And also another issue that thinking about classification we did not take into account, and that applies also to other working groups. The point counter has 12 buttons. How, in practise, such analyses should be preformed? How to evaluate the data?

Regarding the comments I would suggest using cross hair for determining the particle. Trying to make our classification suitable for petrographic analyses and taking into account the char classification by Lester et al. (2010: International Journal of Coal Geology 81 (2010) 333–342) I could suggest the following modifications of this classification:

1. Unaltered particles - macerals of vitrinite, liptinite and inertinite group that were optically not altered by self-heating processes
2. Altered particles – particles that were altered to various degree during self-heating;
   1. porous particles – particles with porosity >75%
   2. mixed porous particles - particles with porosity 25-50%
   3. mixed dense particles - particles with porosity 50-75%
   4. massive particles – particles with porosity <25%
   5. massive particles with cracks - particles with porosity <25% and containing irregular cracks within the particle or perpendicular to the edge of the particle
   6. massive particles with oxidation rims - particles with porosity <25% and paler or darker in colour oxidation rims (comment: regarding the rank, we have only paler or darker in colour oxidation rims)
3. Newly formed particles – particles that formed during self-heating processes:
   1. Pyrolytic carbon
   2. Bitumens

This classification is an attempt to try to quantify the great variety of forms in coal wastes. It is still not taking into account such forms like paler in colour oxidation rims around pores from devolatilization. What about inertinite particles within strongly altered forms? In some particles organic matter occurred as dispersed organic matter in a form of small irregular particles and underwent alteration resulting in its much paler colour. Such particles are detritic and as macerals we would name them vitrodetrinite or inertodetrinite. What about them?!

Discussion:

1. how to present the forms?
2. what about our classification?
3. what about quantitative analysis of organic forms in coal wastes?
4. can we now publish results? or we better modify classification, have one more Round Robin Exercise and.... publish?

Future activity?