XX\textsuperscript{th} Anniversary Meeting of the Petrology Group of the Mineralogical Society of Poland

\textit{From the deep Earth to the human's environment}

Abstracts and field trips guide

Niemcza, Poland, 17-20 October 2013
Rafał WARCHULSKI, Krzysztof SZOPA
Cu-Zn slags from Røros (Norway): a case of rapid cooling and crystal nucleation

Wanda WILCZYŃSKA-MICHALIK, Renata MORYL, Marek MICHALIK
Composition of coal combustion by-products: importance of combustion technology

Piotr WOJTULEK, Jacek PUZIEWICZ, Theodoros NTAFLOS, Michał BUKAŁA
Preliminary data on chromitite from Czernica Hill, Ślęża Ophiolite (SW Poland)

Elżbieta ZWOLIŃSKA, Maciej GÓRKA
Carbons in a carbon – analyses of organic carbon (OC) and elemental carbon (EC) in PM10 dust

Field trips guide

Marek AWDANKIEWICZ
**Stop 1**: Targowica, quarry of basalt (50°41’22.37″N 16°57’55.95″E). Miocene, basaltic scoria cone (structure, deposits, petrology)

Jakub KIERCZAK
**Stop 2**: Why is the Szklary Massif interesting for Earth scientists?

Jacek PUZIEWICZ
**Stop 3**: The Kośmin quarry. Granodiorites of the Niemcza Zone
Composition of coal combustion by-products: importance of combustion technology

Wanda WILCZYŃSKA-MICHALIK¹, Renata MORYL¹, Marek MICHALIK²

¹Institute of Geography, Pedagogical University, 30-084 Kraków, ul. Podchorążych 2; e-mail: wanda.michalik@post.pl
²Institute of Geological Sciences, Jagiellonian University, 30-063 Kraków, ul. Oleandry 2a;

Coal combustion in energy-generating (electricity and heat) plants results in production of significant amount of by-products, e.g. fly-ash and slag (bottom ash). Because of relatively limited range of variation of composition of hard coal used in these plants and similar technologies of combustion used, the composition of fly-ash and slag from different plants was similar. Utilization of by-products of coal combustion increased meaningfully during last decades.

Nowadays, situation is changing, partly due to co-combustion of coal and biomass and modifications in combustion technology. We present data on the chemical and mineral composition of fly-ash and slag obtained from two types of boilers - pulverized fuel boiler and hybrid boiler with fluidized bed adopted also to be fired with pulverized fuel. The same fuel is used in both boilers thus all differences in composition are related to the technology of combustion.

Much higher value of loss of ignition is typical of fly-ash from fluidized bed boiler (11.2 wt. % comparing to 1.8 wt. % in pulverized bed boiler) what is related to abundance of not burnt coal (10.6 wt. % of total carbon content). It is present in irregular, porous, coke-like fragments. Fly-ash from both boilers is composed of quartz, mullite and amorphous glassy material but glass and mullite content is higher in pulverized fuel boilers.

Spherical forms composed mainly of aluminosilicate glass dominate in fly-ash. Their size varies within broad range (from below 1 µm to 50 µm). Other spherical forms are composed of Fe, Ca, Mg, Fe oxides. Beside spherical forms irregular porous glassy grains occur. The content of these grains is higher in fly-ash from fluidized bed boiler.

Slag from pulverized fuel boiler is composed mainly of irregular, often porous, glassy forms (aluminosilicate glass of variable composition with local accumulations of Ca, Mg and Fe oxides), glassy spherical forms and coke-like not burnt coaly matter. Mineral composition of this slag determined by XRD is simply – quartz, mullite and glass. Slag from fluidized bed boiler is different. It is composed of irregular fragments of sedimentary rocks of different types (mudstones, fine-grained sandstones). Results of X-ray diffraction analysis suggest that this slag is devoid of high temperature components (e.g. mullite, glass). Careful study in SEM (equipped with EDS) indicates that rocks are partly welded.

Differences in the composition of fly-ash and slag from both types of boilers are related mainly to the differences in the temperature of combustion.

Acknowledgements: The study was supported by NCN grant No. 0579/B/P01/2011/40.