



Mineralogical composition of fresh slag

M. Kasina (1,*), M. Michalik (1)

(1) Institute of Geological Sciences, Jagiellonian University, Oleandry 2a, 30-063 Kraków, Poland; (*) kasina@geos.ing.uj.edu.pl

Every year tones of blast furnace slag are dumped on heaps, that can caused environmental impact. Nowadays slags have found wide application in many fields of industry. Utilization of slag gives an opportunity to protect natural resources and leads to partial disposal of heaps.

The aim of this study was to determinate the composition of fresh slag taken from the slag-spout about 1,5 hour after heat of pig iron and slag cooling, weathering and stabilization processes on a heap. Macroscopically fresh slag is different than those on heaps. It is heterogenous with glassy upper layer and lower layer with numerous small voids. Typical porous structure was observed in place where glassy layer is cracked. In stabilized form of slag (aged from 2 to 6 months) voids are bigger. Processes of slag stabilization cause changes in mineralogical composition but also can cause the release of harmful components into environment.

Optical microscopy, X-ray diffraction and field emission scanning electron microscopy (FE-SEM) with energy dispersive spectrometry (EDS), were used to determinate composition of slag. Analysed slag is composed mostly of typical calcium silicates and aluminosilicates. Matrix of slag is usually composed of melilite group minerals $(Ca,Na)_2(Al,Mg,Fe)(Si,Al)_2O_7$ with variable amount of MgO and Al_2O_3 , but gehlenite and akermanite end-members are not determinated. Melilite is locally enriched in BaO (4-10 wt %). Components present in mellite matrix are: larnite which represent unstable alpha-phase (Ca_2SiO_4) , wollastonite $(CaSiO_3)$ and merwinite $(Ca_3Mg(SiO_4)_2)$. Gradual decrease of MgO content and increase of CaO is observed in merwinite. Perovskite $(CaTiO_3)$, high temperature feldspar rich in K and Na (anortoclase $(K,Na)AlSi_3O_8$) which contain small amount of BaO (~1 wt %) but also metallic Fe, Al-Mg alloys and Si, Ti, Zr, Fe and Al oxides are present as subordinate components. Sulphides such as CaS and MnS were noted but sulphur content from

0 to 4 wt % was determinate in EDS analyses of various silicate and aluminosilicate components.

Interpretation of results of the study and comparison with literature data allow to affirm that mineralogical composition of fresh slag is not significantly different from stabilized form of slag. Sulphur content is much higher than reported in literature.