Effect of Leaching on the Surface Mineralogy of Steel Slags

S. NEUHOLD[1*], D. HÖLLEN[1], J.J. DIJKSTRA[2], A.VAN ZOMEREN[2], C. ADAM[3], B. ADAMCZYK[3], C. VOGEL[3] AND J. RAITH[4]

[1]Montanuniversitaet Leoben, Chair of Waste Processing Technology and Waste Management, Franz-Josef-Str.18, 8700 Leoben, Austria (*correspondence: simone.neuhold@unileoben.ac.at)

[2]Energy Research Centre of the Netherlands, Westerduinweg 3, 1755 LE Petten, The Netherlands

[3]Bundesanstalt für Materialforschung und –prüfung, Unter den Eichen 87, 12205 Berlin, Germany

[4]Montanuniversitaet Leoben, Chair of Resource Mineralogy, Peter-Tunner-Str. 5, 8700 Leoben, Austria

Electric arc furnace (EAF) slag is a complex multi-phase system comparable to natural rock mineralogy, which can be used as a secondary raw material. To ensure the environmental safety of EAF slags, regarding the mobility of contaminants, it is necessary to understand the controlling mechanisms for the leaching of heavy metals such as Cr and V in this complex system.

Possible controlling mechanisms are the mineralogical binding of contaminants in primary mineral phases, re-incorporation of dissolved species into secondary mineral phases precipitating at the surface, as well as the adsorption of ions onto surface phases.

Therefore, a multi-component geochemical modelling approach is followed using LeachXS^{TM} and Orchestra, which is combined and evaluated by mineralogical and chemical analyses as well as by pH dependent leaching experiments. Hypotheses of secondary mineral formation derived from these models are evaluated via electron microprobe analyses by comparing the slag surfaces before and after the leaching experiment. Additionally, XANES measurements are conducted on both fresh/not leached surfaces and leached surfaces to determine a possible valence change of e.g. Chromium in specific mineral phases caused by leaching.

The relationship between bulk and surface chemistry as well as mineralogy on the one hand and the combination of experimental data and hydrogeochemical models on the other hand make it possible to postulate first hypotheses regarding the influences and mechanisms on leaching of specific contaminants from EAF slags.

The authors thank the Austrian Research Promotion Agency (FFG) for funding the project MiLeSlag and all participating project partners for the support.