ABSTRACT

Slag and fly ash originating from processing lateritic Ni-ore in the districts of Niquelândia and Barro Alto in Brazil are enriched with potentially toxic elements (PTEs). Higher contents of Ni and Co were observed in case of the fly ash (25 g/kg and 462 mg/kg, respectively), whereas higher concentration of Cr was observed in the slag (7, 58 g/kg).

Mineralogical investigations indicate that slag mainly consists of olivine, pyroxene and glassy matrix. High content of glass corresponds to the product of quenching of slag melt in water basins during granulation. In contrast, the fly ash was mineralogically more complex with olivine, pyroxene, glassy phase and partly dehydrated serpentine phase, spinel, $SiO_2$ and the furnace feed residues.

Contaminant leaching was highly pH-dependent with the highest releases of PTEs from the fly ash at pH 3: up to 5, 42 g/kg Ni, 112 mg/kg Co and 4, 3 mg/kg Zn. Slag was significantly more stabile; only 47,9 mg/kg Ni was released at pH 3, but compared to the fly ash higher release of Cr was reported (up to 25.6 mg/kg). Towards alkaline conditions, the leachability of PTEs significantly decreases. Based on physic-chemical parameters of leachates, theoretical speciation of elements and saturation indices for selected solubility-controlling phases were calculated by PHREEQC. The Ni leaching from the fly ash exceeded 100 times the EU limit value for hazardous waste and its safe disposal must be considered, whereas slag was found to be an environmentally stable material suitable for reuse in civil engineering.