Occurrence and distribution of valuable metals in fly ash from Puertollano IGCC power plant, Spain

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ABSTRACT

The occurrence and distribution of Ge, Ni and V in Integrated Gasification Combined Cycle (IGCC) fly ash from Puertollano power plant (ELCOGAS, Spain) is investigated in this study. The use of local Puertollano bituminous coal (enriched in Ge, Pb, and Zn) and petroleum coke (with high contents of V and Ni) as feed fuel for this power plant accounts for a high content of some valuable metals in the gasification fly ash. Due to the reducing environment, the forms of occurrence of most metals in IGCC fly ash is totally different from conventional coal combustion fly ash, from which metals have been extracted. After the physical, mineralogical and chemical characterization of the IGCC fly ash, the forms of occurrence and distribution of valuable metals are reported.

Preliminary extraction tests for Ge evidenced high extraction yields using pure water due to the unusual occurrence of soluble hexagonal GeO_2. Nickel is mainly present in sulfides, and an oxidizing media is needed to reach acceptable extraction yields, whereas vanadium is mainly associated with the aluminium-silicate matrix, and an alkaline extractant is required for the selective extraction.