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EVALUATION OF PYRITE ASH WASTES OBTAINED BY THE SULFURIC ACID PRODUCTION INDUSTRY

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EXTENDED ABSTRACT

In Turkey, pyrite, copper melting gases and sulfur are used like a raw material for the sulfuric acid production. Bandırma Etibank sulfuric acid production factory has 95000 ton/year technical and 25000 ton/year pure, annual sulfuric acid production capacity. In this factory, sulfuric acid is produced by contact method with using flotation pyrite. Pyrite ashes are obtained like wastes from roasting of pyrite ores to produce sulfuric acid. These processes generate voluminous pyrite ash wastes that are generally landfilled from the sulfuric acid production factories and some of them dumps these wastes to Marmara Sea, this creates serious land and environmental pollution problems due to the release of acids and toxic substances. Pyrite ashes can be used first in iron-steel industry like an iron ore and then in the other branches like brick, paint and cement industry to prevent this pollution and evaluate these wastes.

Pyrite ashes are accepted as a hazardous waste because it contains considerable amounts of heavy metals such as iron, copper, zinc, cobalt, lead, nickel, gold and silver. It is possible to recycle these metals with several methods like flotation or leaching. In this study, the recovery of cobalt and copper that is present in pyrite ashes was carried out by acid leaching method. The effects of acid concentration, leaching temperature and leaching time on the dissolution yield of cobalt and copper have been investigated from the leaching analysis. The leaching tests have been carried out using 5,10 or 15% sulfuric acid. It is analyzed at temperatures respectively 50, 70, 85°C for 30, 60, 90 and 120 minutes. The dissolution yield of cobalt and copper are calculated from the leaching analysis. It was found that maximum cobalt and copper dissolution yield is affected using 10% sulfuric acid, at 50°C for 120 minutes leaching time.

Thermal properties of pyrite and pyrite ashes are determined by differential thermal analyses (DTA) and thermogravimetric analysis (TGA). Thermal experiments were carried out using α-alumina reference material between 25°C-1000°C in air atmosphere and at a rate of 10°C/min. As a conclusion, the DTA-TG studies reveal two distinct chemical processes, one occurs between 600°C-800°C and the second one is from 800°C to 1000°C.

Key words: pyrite, pyrite ashes, copper, cobalt, leaching, sulfuric acid, waste, recovery, dissolution yield, DTA-TG.