VITRIFICATION OF JAROSITE WASTE FROM ZINC ELECTROLYTIC EXTRACTION PROCESS

PISCIELLA, P., KARAMANOV, A. & PELINO, M. (University of L'Aquila, L'Aquila, Italy)

Wastes arising from primary raw materials refining and metal extraction plants are presently landfilled. Projects of re-utilisation as secondary raw materials have been presented proposing interesting solutions to the environmental problems generated by waste disposal and providing a new source of raw materials. Jarosite is a by-product generated in zinc hydrometallurgy during the separation of iron after the hot acid leaching of roasted sphalerite concentrate. The jarosite process is a simple and low cost technology but involves the production of a huge quantity of hazardous waste (0.4 t per ton ore).

In this study, the possibility of reutilising jarosite as a secondary raw material by means of vitrification has been investigated.

The wastes were characterised by XRF spectroscopy and the results showed the presence of the elements Fe, S, Si, Zn and Pb. They were subjected to the TCLP (Toxic Characterization Leaching Procedure) by putting them in contact with distilled water for 24 h at constant pH 5 and the leachate was analysed by means of atomic adsorption. In the leachate, zinc (15.5 mg/l) and lead (4.0 mg/l) concentrations largely exceeded the European limits.

Different batch compositions were prepared by mixing jarosite with silica-rich wastes such as granite mud and glass cullet. Fusion was carried out in corundum crucibles in an electric furnace in the 1400–1450 °C temperature range. Glass frit, glass-ceramic tiles and glass fibres were obtained. The materials were characterised in order to investigate their stability and the possibility of re-utilising them in the building industry.

The results obtained highlighted the possibility of incorporating a consistent amount of wastes into glass form products. It has been possible to stabilise hazardous components in glass batches containing up to 50% of waste. The final glass easily passes the TCLP test. The jarosite glasses have characteristics such as density 2.8–3 g/cm^3, thermal expansion 7–8×10^{-6} K^{-1}, and chemical durability in acid and basic media, comparable to that of commercial materials.

The vitrification-recycling of wastes is a combined process that offers solutions to the environmental impact of zinc extraction activities and opens large opportunities for the valorisation of wastes.

References

PELINO, M. (1998). Interceram., **47** (1): 22.

PISCIELLA, P., KARAMANOV, A. & PELINO, M. (1999). Global Symposium on Recycling, Waste Treatment and Clean Technology, San Sebastian, Spain. (1) 153 p.