

Vitrification and Devitrification of Chromium Containing Tannery Ash

Authors : Savvas Varitis, Panagiotis Kavouras, George Kaimakamis, Eleni Pavlidou, George Vourlias, Konstantinos Chrysafis, Philomela Komninou, Theodoros Karakostas

Abstract : Tannery industry produces high quantities of chromium containing waste which also have high organic content. Processing of this waste is important since the organic content is above the disposal limits and the containing trivalent chromium could be potentially oxidized to hexavalent in the environment. This work aims to fabricate new vitreous and glass ceramic materials which could incorporate the tannery waste in stabilized form either for safe disposal or for the production of useful materials. Tannery waste was incinerated at 500oC in anoxic conditions so most of the organic content would be removed and the chromium remained trivalent. Glass forming agents SiO₂, Na₂O and CaO were mixed with the resulting ash in different proportions with decreasing ash content. Considering the low solubility of Cr in silicate melts, the mixtures were melted at 1400oC and/or 1500oC for 2h and then casted on a refractory steel plate. The resulting vitreous products were characterized by X-Ray Diffraction (XRD), Differential Thermal Analysis (DTA), Scanning and Transmission Electron Microscopy (SEM and TEM). XRD reveals the existence of Cr₂O₃ (eskolaite) crystallites embedded in a glassy amorphous matrix. Such crystallites are not formed under a certain proportion of the waste in the ash-vitrified material. Reduction of the ash proportion increases chromium content in the silicate matrix. From these glassy products, glass-ceramics were produced via different regimes of thermal treatment.

Keywords : chromium containing tannery ash, glass ceramic materials, thermal processing, vitrification

Conference Title : ICWM 2015 : International Conference on Waste Management

Conference Location : Copenhagen, Denmark

Conference Dates : June 11-12, 2015