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Vitrification and devitrifiation treatment for the stabilization of chromium containing tannery ash

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Abstract: We report on the vitrification and devitrification of chromium containing ashes originated from the incineration of tannery sludge. The waste was retrieved from the tannery effluent treatment facilities in the industrial area of Thessaloniki in the form of a dried sludge. The sludge was homogenized and characterized structural, morphological and chemical. Due to the high quantities of the contained organic species and Cr the waste could not be safely disposed. Two different incineration conditions were applied in order to remove the organic content while the speciation of Cr in the resulting ash was monitored. The first included incineration in oxygen abundance (oxic) conditions and resulted to complete removal of the organic content and oxidation of Cr to the hexavalent state. On the other hand, incineration under oxygen absence (anoxic) conditions removed part of the organic content and Cr was maintained in the trivalent form [1].

Vitrification was conducted utilizing the Cr-ash from the anoxic conditions which was mixed either with glass forming (SiO_2) and network modifying (Na_2O and CaO) oxides in different proportions [2]or combined with Red Mud and Fly ash, exploiting that they contain high quantities of glass forming and network modifying species. The batch mixtures were melt in a Pt crucible at 1400°C. Subsequently devitrification was conducted in temperatures determined by DTA and resulted to separation of different crystalline phases. Characterization included XRD, SEM-EDS and DTA analysis whlie TEM observations were conducted to study the local structure in the nanoscale. Leaching tests revealed that most of the products were chemically inert.

Finally, stabilization/solidification was conducted through mixing of Cr-ash with scrap soda lime glass in different proportions and sintering in different temperatures. The resulting products where either opaque ceramics or resembled the as-vitrified ones [3].

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