

Production of Composite Materials by Mixing Chromium-Rich Ash and Soda-Lime Glass Powder: Mechanical Properties and Microstructure

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Abstract : A chromium-loaded ash originating from incineration of tannery sludge under anoxic conditions was mixed with low grade soda-lime glass powder coming from commercial glass bottles. The relative weight proportions of ash over glass powder tested were 30/70, 40/60 and 50/50. The solid mixtures, formed in green state compacts, were sintered at the temperature range of 800oC up to 1200oC. The resulting products were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), energy dispersive X-ray spectrometry (EDXS) and micro-indentation. The above methods were employed to characterize the various phases, microstructure and hardness of the produced materials. Thermal treatment at 800oC and 1000oC produced opaque ceramic products composed of a variety of chromium-containing and chromium-free crystalline phases. Thermal treatment at 1200oC gave rise to composite products, where only chromium-containing crystalline phases were detected. Hardness results suggest that specific products are serious candidates for structural applications. Acknowledgement: This research has been co-financed by the European Union (European Social Fund – ESF) and Greek national funds through the Operational Program “Education and Lifelong Learning” of the National Strategic Reference Framework (NSRF) – Research Funding Program: THALES “WasteVal”: Reinforcement of the interdisciplinary and/or inter-institutional research and innovation.

Keywords : chromium-rich tannery residues, glass-ceramic materials, mechanical properties, microstructure

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