SYNERGIC GREEN TECHNOLOGIES FOR TREATMENT OF HEXAVALENT CHROMIUM POLLUTED WATERS

Goal of the project

The first major objective of this project will be to study the influence of co-presence of sand, MnO_2 and sand coated with manganese oxides on Cr(VI) efficiency of removal with metallic iron. The second major objective of this project is to study the immobilization of exhausted reactive mixtures containing Fe, Cr, sand and MnO_2 in vitreous matrices. The Cr, Fe and Mn immobilization in the glass matrix will be analyzed in order to convert the resulting glasses into marketable glazes or bulk glass products.

Short description of the project

The proposed theme is integrated in the thematic area of water and wastewater treatment, with the aim of water reuse, waste recovery and protection of environment quality.

Project implemented by

University Politehnica Timisoara

Implementation period

01.10.2015-30.09.2017

Main activities:

1. Batch treatability experiments. Will be performed using a Berzelius flask containing Cr(VI) solution. Determined amounts of reactive materials are added to the solution and flask contents will be mixed continuously. Aliquots will be periodically extracted and analyzed.
2. Continuous long term column treatability experiments. Will be performed using an experimental setup comprising: columns with reactive material filling; peristaltic pump used to pass the Cr(VI) aqueous solution through the column; storage tank for the Cr(VI) solution. The Cr(VI) solution will be passed through the column packed with reactive material filling. Column effluent samples will be withdrawn at regular time intervals and analyzed.
3. Experiments regarding the synthesis of glasses from wastes. The exhausted reactive materials will be mixed with glass powders and borax and then melted in an electric furnace. In order to obtain bulk glass products the melt is press-quenched between two stainless steel blocks and annealed to remove stress. The granular frits are obtained after pouring the melts in cold water. The glaze slurry is prepared using the obtained frits (95%) and kaolin (5%) as suspension material. The terracotta plates glazed by immersion are dried and then fired at 980°C for 30 min. For the porous glass synthesis a foaming agent (SiC) was added together with the waste glass powder and the exhausted reactive mixtures. The raw materials are mixed together and then uniaxial pressed into cylindrical samples. The samples, dried at 80°C for 12 hours are treated at 900°C for 10 minutes.

Results

The assessment of sand co-presence on Cr(VI) removal with metallic iron.
The assessment of MnO_2 co-presence on Cr(VI) removal with metallic iron.
The assessment of MnO_2 and sand mixtures co-presence on Cr(VI) removal with metallic iron
The immobilization of exhausted reactive mixtures containing sand, Fe and Cr in vitreous matrices.

Applicability and transferability of the results

Treatment of waters polluted with Cr(VI).
Conversion of wastes into marketable glazes or bulk glass products

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Research Centre

ICER

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