

TREATMENT OF STAINLESS STEEL PICKLING RESIDUES FOR ENVIRONMENTAL SAFE DISPOSAL

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Abstract: Stainless steel pickling residues (SSPR) contain large amounts of heavy metals and are classified as hazardous waste. The most significant heavy metals in the SSPR are chromium (Cr) and nickel (Ni) which are very toxic to human health and the environment. In this study, the treatment of SSPR typical found in China was conducted. Three types of fly ash from coal-fired power plants in both China and the United States were used as binder to stabilize the SSPR. Aluminium potassium sulfate ($KAl(SO_4)_2$), a readily and economically available chemical in the market, was used as an additive to enhance the stabilization treatment. The China standard method HJ/T 299 “Solid Waste Extraction Procedure for Leaching Toxicity: Sulphuric and Nitric Acid Method” was used to examine the treatment effects. The results showed that a fly ash-toSSPR ratio of 1:1.5 with the addition of 10% $KAl(SO_4)_2$ (on mass basis), the treated SSPR can meet the China regulatory standards for defining the waste as non-hazardous so that it can be disposed of in ordinary industrial waste landfills. Microstructure analysis with scanning electron microscopy (SEM) indicated a strong structural enhancement in the treated SSPR that can help the entrapment of the heavy metals from leaching out.

Keywords: Pickling residues, stainless steel, heavy metal, hazardous waste, stabilization, disposal