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Preparation of Chromium Nanoparticles on Carbon Substrate from Tannery Waste Solution by Chemical Method Compared to Electrokinetic Process

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Abstract : This work shows the preparation of chromium nanoparticles from tannery waste solution on glassy carbon by chemical method compared to electrokinetic process. The waste solution contains free and soluble fats, calcium, iron, magnesium and high sodium in addition to the chromium ions. Filtration helps removal of insoluble matters. Diethyl ether successfully extracted soluble fats. The method started by removing calcium as insoluble oxalate salts at hot conditions in a faint acidic medium. The filtrate contains iron, magnesium, chromium ions and sodium chloride in excess. Chromium was separated selectively as insoluble hydroxide sol-gel at pH 6.5, filtered and washed with distilled water. Part of the gel reacted with sulfuric acid to produce chromium sulfate solution having 15-25 g/L concentration. Electrokinetic deposition of chromium nanoparticles on a carbon cathode was carried out using platinum anode under different galvanostatic conditions. The chemical method involved impregnating the carbon specimens with chromium hydroxide gel followed by reduction using hydrazine hydrate or by thermal reduction using hydrogen gas at 1250°C. Chromium grain size was characterized by TEM, FT-IR and SEM. Properties of the Cr grains were correlated to the conditions of the preparation process. Electrodeposition was found to control chromium particles to be more identical in size and shape as compared to the chemical method.

Keywords : chromium, electrodeposition, nanoparticles, tannery waste solution
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