

ELECTRODEPOSITION OF ALUMINUM IN 1-METHYL-3- HEXYL IMIDAZOLIUM CHLORIDE IONIC LIQUID AT LOW TEMPERATURES

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Abstract

The electrodeposition of aluminum using ionic liquids at ambient temperatures was performed. The ionic liquid consisted of 1-methyl-3-hexyl imidazolium chloride (C₆mimCl) and anhydrous AlCl₃. The electrolysis was performed at low temperatures 100 ± 5°C. Electrodeposition was performed on copper electrodes. Impure aluminum (80wt% Al) electrodes were used as the anodes, which were dissolved by the passage of the electricity. The products were analyzed using X-ray diffractometer, mass spectrometer and atomic absorption spectrometer. Bright and fine-grained aluminum was deposited at a cathode current efficiency of 99%. The effects of electrolyte composition, cell voltage and temperature on the electrolytic process were discussed. Impurities such as Si, Cu, Zn, Fe, Mg, Ni, Mn, and Pb were effectively removed as anode residue. Impure aluminum of 80wt% was purified to 99.9wt% in the electrolytic cell. Low temperatures and low voltages were applied in the present electrolytic process that resulted in low energy consumption of 3.0kWh/kg. High current densities ranging from 300-700A/m² were obtained. There were no pollutant emissions in the present process. Advantages of the present process over the current industrial methods are low temperature, low energy consumption and no pollutant emissions.

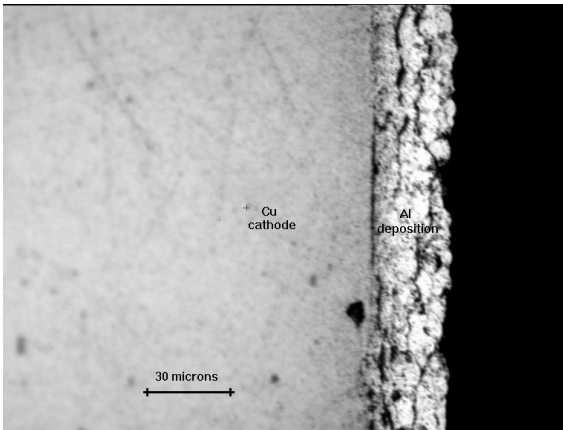


Fig. 2. Aluminum deposited on copper cathode.

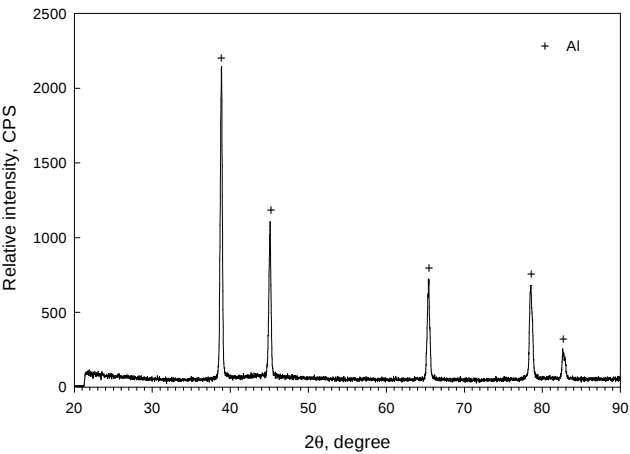


Fig. 1. X-ray diffraction pattern of the deposited aluminum.