Microstructure and Electrochemical Behaviour of some SnO_2-based Inert Electrodes in Aluminium Electrolysis

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Some types of anodes that could replace the usual carbon anodes in aluminium production by the Hall-Heroult process are based on SnO_2. The present investigation deals with SnO_2-Sb_2O_3-CuO ceramics having an SnO_2 content of $\geq$96%), Sb_2O_3 and CuO being dopants. The ceramic pellets, thermally treated at 1400 °C for 4 hours, were analysed by X-ray diffraction and IR spectroscopy. The structural analysis of the samples evidenced an $SnO_{2\,(ss)}$ type solid solution. All samples were electronically conductive (small negative values of the Seebeck coefficients), having an activation energy ranging within 0.02 - 0.3 eV.

The anodic polarisation curves obtained with those anodes in an electrolyte of 88% Na_3AlF_6, 7% Al_2O_3 and 5% CaF_2 were studied. The results were correlated with the microstructure of the investigated samples.

Key words: SnO_2 Ceramics; Inert Anodes; Anode Polarisation; Molten Salts.