

Studies on Promising Cell Performance with H_2SO_4 as the Catholyte for Electrogeneration of Ag^2 from Ag in HNO_3 Anolyte

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Electrochemical cell performance of a divided cell with electrogeneration of Ag^2 from Ag in 6 M HNO_3 anolyte has been studied with 6 M HNO_3 or 3 M H_2SO_4 as the catholyte. This work arose because in mediated electrochemical oxidation (MEO) processes with $Ag(II)/Ag(I)$ redox mediator, generally HNO_3 is used as catholyte, which, however, produces NO_x gases in the cathode compartment. The performance of the cell with 6 M HNO_3 or 3 M H_2SO_4 as the catholyte has been compared in terms of (i) the acid concentration in the cathode compartment, (ii) the Ag to Ag^2 conversion efficiency in the anolyte, (iii) the migration of Ag from anolyte to catholyte across the membrane separator, and (iv) the cell voltage. Studies with various concentrations of H_2SO_4 catholyte have been carried-out, and the cathode surfaces have been analyzed by SEM and EDXA; similarly, the precipitated material collected in the cathode compartment at higher H_2SO_4 concentrations has been analyzed by XRD to understand the underlying processes. The various beneficial effects in using H_2SO_4 as the catholyte have been presented. A simple cathode surface renewal method relatively free from Ag deposit has been suggested.