

CU, ZN AND CU-ZN ALLOYS ELECTRODEPOSITION FROM IONIC LIQUIDS

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Electrodeposited thin films and nanowires of zinc, copper and their alloys were deposited from the ionic liquid 1-butyl-1-methylpyrrolidinium bis(trifluoromethylsulfonyl)imide. The anion of the metallic salt (Bis(trifluoromethylsulfonyl)imide) was the same as that used as solvent. The electrochemical experiments were performed at room temperature in an argon-filled glove-box with water and oxygen content below 1 ppm. The electrodeposition and the morphology of zinc, copper and their mixed deposits are reported. The obtained voltammograms are complicated and exhibit several electrodeposition steps (Fig. 1).

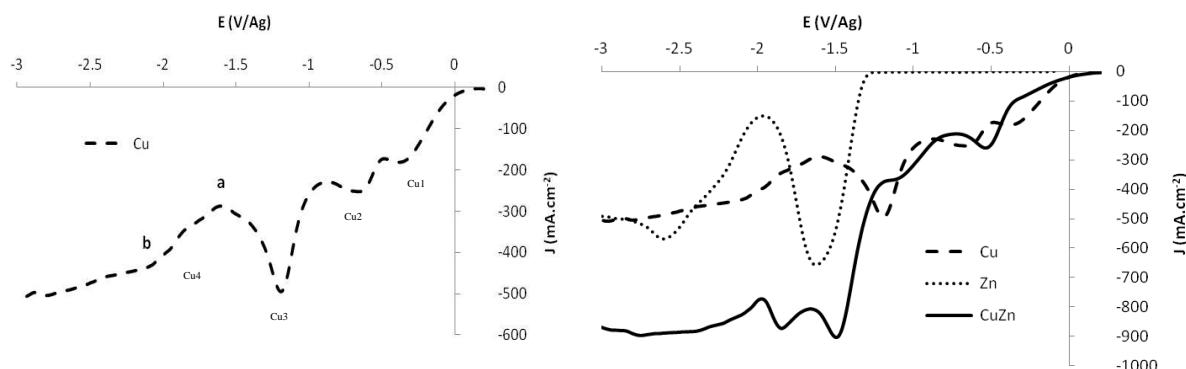


Fig. 1

In the copper deposition case, no deposit was obtained in the first step what was attributed to the reduction of Cu(II) in Cu(I). All the other steps lead to obtain metallic deposits. For zinc deposition, whatever the step was, metallic deposits were obtained.

The copper-zinc composition versus potential was studied (Fig. 2). The obtained evolution does not fit with a logic progression versus the overpotential i.e. with a regular increase of zinc. At the beginning of zinc reduction, the evolution of the composition seems to be in agreement with a classical progression versus polarization, but a decrease of zinc percentage appears with the beginning of Cu₄ step (point a). Finally, when the limiting diffusion current of Cu₄ step appears (point b), the Zn percentage raises for the second time with overpotential until reaching a value close to the metallic salts composition.

This global trend of the composition evolution suggests that an inhibition of zinc reduction was present due to the partial occupation of adsorption sites by copper intermediates.

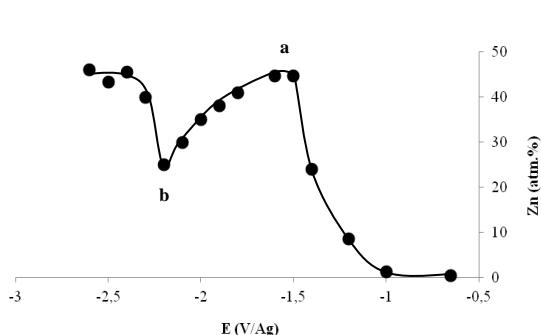


Fig.2

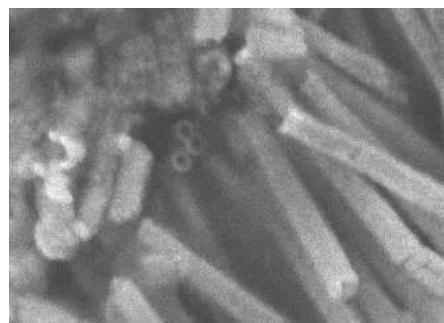


Fig.3

At last, some of the Cu-Zn deposits were performed inside the polycarbonate membranes. The obtained nanostructures appear to be more like nanotube-forms than nanowires (Fig. 3).