ELECTROCHEMISTRY OF GALLIUM AND ELECTROCHEMICAL FORMATION OF Cu-Ga INTERMETALLIC COMPOUNDS IN CHOLINE CHLORIDE-ETHYLENE GLYCOL (1:2)

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Gallium is a suitable material for producing semiconductor compounds (e.g. GaAs, GaInAs, CuGaSe₂ and Cu(In,Ga)Se₂) used in electronic and optoelectronic technology. As a part of a project to look into the ability of deep eutectic solvents (DES), as reaction media, to deposit high-quality semidconducting films, the present work is concerned with the electrochemical behaviour of gallium, in the eutectic mixture Choline Chloride – 2 Ethylene Glycol (ethaline). The study has been carried out using different substrates as working electrodes: i) Pt, Mo, W for the electrochemical deposition of Ga(liq) and ii) Cu for the electrochemical formation of Ga-Cu intermetallic compounds.

Ga electrodeposition is difficult from aqueous solution due to its low standard potential and the interfering hydrogen evolution reaction. The use of Ethaline, with a better thermal stability and larger potential window, eliminates the interference of solvent breakdown reactions during Ga deposition on Pt, W and Mo electrodes.

Cyclic voltammograms of a GaCl₄ solution on:

- A Mo electrode at 80°C
- A copper substrate

The electro-reduction of GaCl₄ solutions was also investigated at a copper substrate. Ga-Cu alloy films were obtained by continuous potentiostatic electrolysis and intensiostatic pulse electrolysis. The obtained samples, characterized by XRD and SEM, revealed the formation of CuGa₂.

Acknowledgements

Authors thank the Junta de Castilla y León (RIS3 de Castilla y León 2014-2020), Project CLU-2017-09 for financial support.