Electrodeposition of semiconductors thin films with different composition and band gap

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The global environmental concerns and the escalating demand for energy, coupled with a steady progress in renewable energy technologies, are opening up new opportunities for the utilization of renewable energy resources. The research activity of our group is mainly focused on electrodeposition at nanometer scale. Electrodeposition is well known for depositing metals and metallic alloys at the industrial level, with a wide range of applications from large area surface treatments to most advanced electronic industries. Electrodeposition of semiconducting materials represents a new challenge, not only from the academic point of view, but also from the economic point of view, since this method presents interesting characteristics to obtain large area materials at low cost and generally low temperature with soft processing. The Electrochemical Atomic Layer Epitaxy (ECALE) [1] method was used to obtain compound semiconductors. This study reviews the state of art of the literature on the knowledge about chalcogenide materials, and it sets up perspectives for photovoltaic applications. We also present some results about thin films of Cu_3SnS_4 (kuramite) and Cu_2ZnSnS_4 (kesterite) obtained by electrodeposition and their chemical-physics characterization. We present new results where we modulated composition, bandgap, morphology and structure of semiconductor thin films obtained by electrodeposition.

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