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Kesterite group materials thin films by Elettrodeposition for photovoltaic applications.

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The task for renewable energy resources is stimulating the research for new materials allowing to set up low cost and high conversion efficiency solar cells. The kesterite-like quaternary chalcogenides (Cu_2ZnSnS_4, or CZTS) attracted a relevant interest from worldwide researchers, due to their good performances (up to 10 % conversion efficiency [1]) and to the absence of relevant economic or environmental concerns associated to their use in the solar cells production.
A recent reconsideration of materials belonging to the pseudoternary system Cu_2FeSnS_4 (stannite) - Cu_2ZnSnS_4 (kesterite) - Cu_3SnS_4 (kuramite), to which CZTS belongs, evidenced promising phases which can be related to CZTS adding band-gap tunability thanks to the isomorphous replacement of Cu with Fe, Zn ions.
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 for large area, low cost and generally low temperature and soft processing of materials. The Electrochemical Atomic Layer Epitaxy (ECALE) [2] method was used to obtain multinary sulfide semiconductors on Ag(111). The amount of the elements deposited in the first layers of the compound was determined by the oxidative stripping of cations, followed by the reductive stripping of anions. This talk reviews the state of art of the literature on the knowledge about these Kesterite group materials, and it perspectives for photovoltaic applications. We also present some results about thin films of Cu_3SnS_4 (kuramite) and Cu_2ZnSnS_4 (kesterite) obtained by elettrodeposition and their chemical-physics characterization.

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