New Materials for Energy Applications with High EROEI values (Energy Returned On Energy Invested)

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The world energy situation (despite this period of low cost oil due to reasons far removed from the market itself) with a growth in demand and a forced reduction of the energy supply has given more importance to the factor EROEI (Energy Returned On Energy Invested). This coefficient, which when referred to a given energy source indicates its convenience in terms of energy output, has arrived in many research areas becoming an important parameter to evaluate, compare and make strategic choices. 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. In this presentation, we exploited alternated electrodeposition of some metals by E-ALD (Electrochemical Atomic Layer Deposition) to obtain thin films, controlling the growth of the structures at the nanometric level. In this presentation we will report the results for the electrodeposition of an entire p-n junction of semiconductors deposited by E-ALD technique. We also present a structural study of these composite ultra-thin films by means of electrochemical operando SXRD experiment performed at ID03 in Grenoble. With this type of approach will be presented the results of modified surfaces obtained by electrodeposition or new catalysts obtained from microwave assisted pyrolysis (MAP) of waste tires for direct alcohol fuel cells.
A fundamental aim of material sciences is to reckon the relationship between the properties of a device, and the morphological and structural characteristics of the surface. Combining basic electrochemical techniques with spectroscopic, microscopic and structural techniques is crucial for characterizing the structure-activity relationship for many different Materials for Energy Applications.

Key words: EROEI; Electrodeposition; Fuel Cells; Recycle; Solar Cells.

2014 2020 POR CreO REGIONE TOSCANA FONDO EUROPEO DI SVILUPPO REGIONALE
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