

## Physics seminar

Monday, 21<sup>st</sup> June 2010 at 15h00

Campus Kirchberg

Salle des Conseils

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### **“Electrodeposition of chalcopyrite semiconductor thin films from ionic liquids”**

Chalcopyrites are semiconductors used in thin film solar cells. In our group, research work is carried out to fabricate this material ( $\text{CuInSe}_2$ ,  $\text{Cu(In,Ga)Se}_2$  or  $\text{CuGaSe}_2$ ) using low energy methods. One chosen approach is to electrodeposit precursor films and subsequently anneal them to form the semiconductor. Electrodeposition and annealing (EDA) is recognized as a low cost fabrication process for chalcopyrite thin films. The challenge for the EDA process is the successful incorporation of gallium into the films. The electrodeposition of gallium from aqueous electrolyte is not trivial because of the interfering hydrogen evolution reaction (HER). However the incorporation of Ga is essential to achieve high efficiency solar cells.

Ionic liquids offer larger electrochemical potential windows and thus eliminate the interference of solvent breakdown reactions during electrodeposition.

We will present the efficient electrodeposition of Ga and Cu-Ga layers from the deep eutectic based ionic liquid consisting of choline chloride and urea (1/2 molar ratio). Cu-Ga layers are codeposited and converted by thermal annealing in Se atmosphere to  $\text{CuGaSe}_2$  thin films. The films were processed into complete  $\text{CuGaSe}_2$  solar cell devices. Latest results will be presented.