

## **ELECTRONIC TRANSPORT PROPERTIES OF THE $\mu\text{C}-(\text{Si,Ge})$ ALLOYS PREPARED BY ECR**

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Some  $\mu\text{C}-(\text{Si,Ge})\text{:H}$  alloys have been grown using low pressure, reactive ECR plasma deposition with high H dilution and subtle (sub ppm) B-doping. Incorporating these high quality materials into devices leads to low gap  $\mu\text{C}-(\text{Si,Ge})$  solar cells with acceptable performance. This justifies a detailed investigation of the electronic transport properties of  $\mu\text{C}-(\text{Si,Ge})\text{:H}$  alloys by employing the microwave photomixing technique.

From the measurements of the electric field dependence of the drift mobility and lifetime, we have found strong evidence for the existence of long-range potential fluctuations in  $\mu\text{C}-(\text{Si,Ge})\text{:H}$  alloys. We determine the depth and range of the potential fluctuations, and subsequently the charged defect density, as a function of the deposition rate. It was found that the film transport properties do not degrade or enhance monotonically with increasing deposition rate; there exists a valley point where the strongest potential fluctuations occur as a result of a significant increase in the charged defect density. Beyond this point, the film quality increases again. The evidence indicates that it is the long-range potential fluctuations that result in the deterioration of the transport properties of  $\mu\text{C}-(\text{Si,Ge})\text{:H}$  alloys. Specifically, it is the increase in the depth, and a decrease in the length of the potential fluctuations, which lead to a decrease in the mobility, and consequently in the photoconductivity. Our present results demonstrate that aside from the increase of charged scattering centers, compositional disorder in the alloys play an important role with the build-up of the potential fluctuations.

TOPICS + KEYWORDS: thin film material,  $\mu\text{C}-(\text{Si,Ge})\text{:H}$  alloys, ECR technique.