FORMATION OF EPI-SI LAYER FOR THIN FILMS SILICON SOLAR CELLS BY ECR-CVD

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RÉSUMÉ

We investigated the formation of microcrystalline silicon (µc-Si :H) epitaxially grown on polysilicon seed layer on aluminium substrate using Electron cyclotron resonance plasma enhanced chemical vapor deposition method (ECR-PECVD). The µc-Si :H film serves as an active intrinsic absorber layer for a PIN configuration solar cell. A seed polysilicon (P^+) layer was created by depositing amorphous silicon by ECR-PECVD method (using SiH_4/Ar gases) directly on Al substrate followed by thermal annealing at 550^0C resulting in a layer exchange. The µc-Si:H films was then deposited using a SiH_4/H_2 gas mix employing the same reactor. The optimization of deposition parameters was carried out on Cz Si wafers. The parameters which allowed to reach the highest crystalline fraction of ~ 65% are obtained for SiH_4=4 sccm, H_2=40 sccm and a deposition temperature 480^0C. The Raman spectroscopy was carried out on the deposited films to determine the crystalline fraction while the spectroscopic ellipsometry measurements were applied to get insight on the optical constants of the deposited layers as well as on their thickness. X-ray diffraction (XRD) measurements were taken to identify the crystalline phase of the deposited film and surface morphologies of films were observed by scanning electron microscopy (SEM).

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Mots Clés : ECR-PECVD, Micro-crystalline silicon films, Spectroscopic Ellipsometry, Raman Spectroscopy