EPFL STI IMT-NE PV-LAB

Seminar

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MT 2 11.00

Rue A.-L. Breguet 2, CH-2000 Neuchâtel

Crystalline Silicon Surface Passivation for Silicon Heterojunction Solar Cells

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ABSTRACT

Crystalline silicon surface passivation by hydrogenated amorphous silicon (a-Si:H) deposited by three different chemical vapor deposition (CVD) techniques at low (T ~ 130°C) temperatures is investigated. For all three techniques, surface recombination velocities (SRVs) are reduced by two orders of magnitude after prolonged thermal annealing at 200°C. Modeling of our injection level dependent minority carrier lifetime data shows that this reduction correlates with a decreased dangling bond density at the amorphous-crystalline interface, indicating that dangling bond saturation is the predominant mechanism. All three deposition methods yield high quality surface passivation. For a-Si:H layers deposited by radio frequency plasma enhanced CVD (rf PECVD), we obtained outstanding carrier lifetimes of 10.3 ms for 50 nm thick films at an injection level of 10^{15} cm^{-3}, corresponding to SRVs below 1.32 cm/s [1]. For VHF PECVD (5.4 ms) and HWCVD (3.7 ms) a-Si:H layers we also obtained good c-Si surface passivation.

[1] J.W.A. Schüttauf *et al.*, Appl. Phys. Lett. **98**, 153514 (2011).