Silicon surface passivation by hot-wire CVD Si thin films studied in situ surface spectroscopy

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Deposition Mechanism 1

Chair: Hideki Matsumura
Day: **Thursday August 21** Time: **09:00**

09:00 – 09:40 Invited Lecture:

Silicon surface passivation by hot-wire CVD Si thin films studied by in situ surface spectroscopy

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Silicon thin films can provide an excellent surface passivation of crystalline silicon (*c*-Si) which is of importance for high efficiency heterojunction solar cells or diffused emitter solar cells with well-passivated rear surfaces. Hot-wire chemical vapor deposition (hotwire CVD) is an attractive method to synthesize Si thin films for these applications as the method is ion-bombardment free yielding good quality films over a wide range of deposition rates. The properties of the interface between Si thin films and H-terminated *c*-Si substrates have been studied during film growth by three complementary in situ techniques. Spectroscopic ellipsometry has been used to determine the optical properties, film thickness and surface roughness whereas information on the H-bonding modes and H-depth profile has been obtained by attenuated total reflection infrared spectroscopy. Second-harmonic generation (SHG), a nonlinear optical technique sensitive to surface and interface states, has been used to probe two-photon resonances related to modified Si-Si bonds at the interface. The observations have been correlated with ex situ lifetime spectroscopy experiments. On the basis of the results, the growth and surface passivation mechanism of the films will be discussed, including the role of defect states, built-in electric fields, (nanometer-level) epitaxial growth, influence of the substrate temperature, etc.