

Effect of deposition rates of PECVD silicon nitride films on passivation for silicon solar cells

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Key words : solar cell, silicon nitride, PECVD, deposition, passivation, lifetime

Abstract : Hydrogenated amorphous silicon nitride films grown by plasma-enhanced chemical vapor deposition (PECVD) are widely used as the surface passivation and antireflection layer in crystalline silicon solar cells. The silicon nitride films with different deposition rates were deposited onto silicon wafers by PECVD using a 13.56 MHz direct plasma system and a gas mixture of silane (SiH₄), ammonia (NH₃) and hydrogen (H₂). In order to study the surface passivation quality of the silicon nitride films, the effective carrier lifetimes (τ_{eff}) of the planar and textured silicon wafer specimens were measured.

In this study, the effective carrier lifetimes of silicon wafer specimens deposited by silicon nitride films with different deposition rates during the PECVD process were measured using QSSPC technique. The deposition rate investigated in this study is between 7 and 10 nm/min. The thickness of the silicon nitride films is 50–80 nm and the refractive index is in the range from 1.9 to 2.2.

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