

OPTICAL PROPERTIES OF SILICON NANOSTRUCTURED THIN FILMS

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ABSTRACT

Optical properties of Silicon (Si) nanostructures were investigated. Amorphous Si-rich silicon oxide (Si-rich SiO_x) films were grown on intrinsic Si wafer and quartz substrates by using the reactive Radio Frequency (RF) magnetron sputtering technique. Oxygen and argon gas were fed into the vacuum chamber during the deposition to form a mixture of oxygen and argon plasma. High temperature post annealing produced the Si nanocrystals embedded in Si oxide. Photoluminescence (PL) spectra of samples before and after post-annealing in air were compared. The PL intensity increased after annealing. Strong ultraviolet (UV) and blue emission have been observed from the annealed sample. The blue emission was related to the neutral oxygen vacancies from the SiO_x films, and the UV emission was ascribed to luminescence centers at the interface between the Si nanocrystals and the SiO₂ matrix. Raman scattering was employed to monitor the chemical changes before and after high-temperature annealing.

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