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Optical properties of silicon nitride films by plasma-enhanced chemical vapor deposition

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Silicon nitride films were deposited on Si(001) substrate by using plasma enhanced chemical vapor deposition. The optical properties of these films have been investigated using photoluminescence (PL), x-ray photoelectron spectroscopy (XPS) and atomic force microscopy (AFM) measurement. The PL peak energies were varied between 1.75 and 2.75 eV by adjusting the flow ratio of silane to nitrogen gas. It was also found that the PL intensity observed in annealed films at 700-1000 oC was 4-10 times stronger than as deposited films. In this work, the origins of the emission from the silicon nitride films will be discussed.