

【포스터 : 나노01】

Visible luminescence from nanocrystalline silicon films produced by Ion-beam sputtering deposition

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Nanocrystalline silicon(nc-Si) thin films are produced by ion beam sputtering deposition and recrystallization of amorphous-Si/SiO₂ multilayers. The recrystallization is performed by furnace annealing at 1200°C in N₂ ambient. The observation of visible photoluminescence(PL) peak position is 750-820nm at room temperature. This is attributed to nanocrystalline silicon created by recrystallization. The fitted peak emission energy $E(eV) = 1.60 + 0.72d^{-2}$ is in accordance with effective mass theory for quantum confinement by the wide-gap SiO₂ barriers and also with the bulk amorphous Si band gap. High resolution transmission electron microscopy(HR-TEM) is investigated to formation of nanocrystalline silicon. TEM images show an ordered structure with Si nanocrystals confined between SiO₂ layer. The size of the Si nanocrystals is limited by the thickness of the a-Si layer, the shape is nearly spherical, and orientation is random. The luminescence from the nc-Si multilayers is demonstrated and studied.