

Investigations of structural and optical properties of zinc oxide thin films growth on various substrates

ABSTRACT

In this research, the structural and optical properties of Zinc Oxide (ZnO) thin film were successfully deposited on various substrates including silicon (Si), sapphire (Al₂O₃), polyethylene terephthalate (PET) and polypropylene carbonate (PPC) by Radio Frequency (RF) sputtering technique. In this project, the structural and optical properties of the samples were studied by using X-ray diffraction (XRD), field-emission scanning electron microscopy (FESEM), atomic force microscopy (AFM), Raman Spectroscopy, and Photoluminescence (PL). The XRD test revealed that the samples have a wurtzite structure as the peaks dominated by ZnO (0 0 2). AFM test found out that root mean square (rms) for thin film samples ranging from 1 to 8 nm. Raman spectra detected the existence of certain Raman-active modes inside the samples. In PL spectra, the peak emissions observed for all the ZnO thin film samples ranging around 376.05–381.5 nm, thus closer to the pure ZnO. Through the FESEM image, most of the samples except ZnO/PPC sample showed the granular surface morphology, while the ZnO/PPC sample revealed the hexagonal like shapes with uniform distribution. The results exhibited that the ZnO thin films grown on ZnO/PET have the best quality among all the samples.

Keyword: Structural properties; Optical properties; Zinc oxide