

Nanooptics and photonics

Optical linear and nonlinear absorption study of CuO film

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Copper oxide (CuO) is a *p*-type metal-oxide semiconductor with narrow band gap. It has attracted considerable attention due to wide range of potential application in solar cells, photothermal and photoconductive catalysis, gas sensors, high-temperature superconductors, etc. The electrical and optical properties of CuO are already well examined, but there is still lack of study on nonlinear absorption.

The topology of RF-magnetron sputtered CuO film has been investigated using atomic force microscopy (AFM) which confirms its nanostructured nature (Fig. 1a). Optical absorption spectrum has been measured and the indirect band gap energy has been determined using Tauc method to be 1.22 eV (Fig. 1b). Nonlinear absorption has been estimated by means of open aperture (OA) Z-scan method employing 523 nm, 30 ps laser beam [1]. The nanostructured CuO film showed saturable absorption behavior at high laser intensity (Fig. 1c). Extracted value of nonlinear absorption ($\beta = -3.4 \cdot 10^{-7}$ m/W) has a considerable impact of the excited state absorption since laser wavelength falls into the region of CuO absorption.

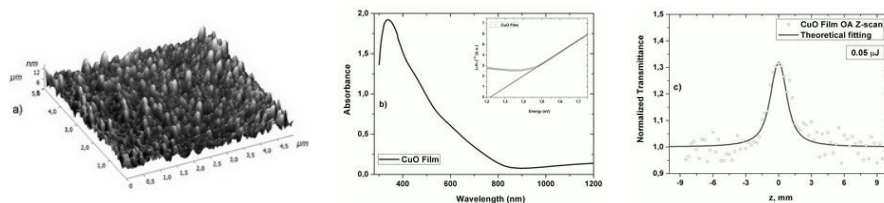


Fig.1. Nanostructured CuO film: a) AFM topology image; b) optical absorption spectra; c) open aperture Z-scan with theoretical fitting.

1. Kulyk B., Kerasidou A.P., Soumahoro L., Moussallem C., Gohier F., Frère P., Sahraoui B. // RSC Adv. -2016. -6. -P. 14439.