

Enhancement of nonlinear absorption and optical limiting properties of graphene oxide mixed with Fe₂O₃ nanoparticles

Masoud Dehghanipour, Mohammad Khanzadeh*, Shabnam Abutalebi

Department of Physics, Faculty of Science, Vali-e-Asr University of Rafsanjan, Rafsanjan, Iran

Received: 30.03.2017 Final revised: 08.04.2018 Accepted: 07.05.2018

Abstract

In this research, graphene oxide (GO) was mixed with Fe₂O₃ nanoparticles by using sonication with 10:1 volume ratio. The nonlinear absorption of graphene oxide, Fe₂O₃ nanoparticles, and the mixture of GO- Fe₂O₃ were studied by using open aperture Z-scan method. Also, the optical limiting of these materials was investigated. It was observed that the nonlinear absorption and optical limiting of graphene oxide increased when mixed with Fe₂O₃ nanoparticles. The light source that was used in all experiments was a continuous wave laser diode at 532 nm wavelength. In Fe₂O₃ nanoparticles a switch over from saturable absorption to reverse saturable absorption behavior with increasing the input intensity was observed. In GO and GO-Fe₂O₃ samples, with increasing intensity the depth of valley in open aperture Z-scan curves increased and their nonlinear absorption coefficient rose to an optimal value. It was also observed that in GO-Fe₂O₃ mixture by increasing the length of the sample, optical limiting power increased.

Keywords: Z-scan method, Graphene oxide derivatives, Two photon absorption, Reverse saturable absorption, Excited state absorption

* Corresponding Author: mohammadkhanzadeh717@yahoo.com