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Study of optical nonlinearity in PLD grown NiZnO thin film

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The demand for new generation devices warrants the integration of electronic, magnetic and optical properties in the device material. Transition metal ion doped ZnO materials are well known for their spintronic applications. Apart from this, these materials can also be important for nonlinear (NL) device applications like optical limiting devices, optical switches etc, if their NL optical properties are well understood. In the present paper, we report the optical nonlinearity in the pulsed laser deposited Ni_{0.03}Zn_{0.97}O film at excitation energy much smaller than the energy band gap of the film. We have employed the standard z-scan technique to determine the imaginary part of third order NL susceptibility and the NL absorption coefficient of Ni doped ZnO thin film. Good NL optical response has been observed in NiZnO film in the off-resonant regime. In the open aperture z-scan experiment, a dip is found at the focus indicating the decrease in absorption of light with increasing light intensity. The NL absorption coefficient and the imaginary part of third order NL susceptibility were found to be 0.74 m/W and $7.6 \times 10^{-10} \text{ m}^2/\text{V}^2$, respectively. The observed NL in Ni_{0.03}Zn_{0.97}O film is ascribed to the two photon absorption followed by the free carrier absorption provided by the oxygen vacancy defects. Such a large value of NL absorption coefficient indicates that NiZnO material has a very good optical limiting behaviour.

Biography

Arpana Agrawal received Master's degree in Physics in the year 2011 from School of Physics from Devi Ahilya University Indore, India with distinction and MPhil physics in the year June 2012 from school of Physics Devi Ahilya University Indore. She is doing her PhD from School of Physics Devi Ahilya University Indore India. Her area of research is Optical Transport and magneto transport studies of ZnO based multilayer structures. She coauthored about 7 papers in International peer reviewed journals.

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