



Study of structural and magnetic properties of laser-irradiated zinc ferrite material

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ABSTRACT

Crystalline ZnFe_2O_4 (zinc ferrite) material was prepared using the sol-gel technique and converted in the forms of 3 pellets, out of which 2 pellets were irradiated at room temperature by pulsed Nd:YAG laser with 1.5 W, $\lambda = 532$ nm named ZF1 and continuous AlGaAs diode laser of 4 W, $\lambda = 808$ nm called ZF2, respectively, while the 3rd pellet was kept as control and named ZF. Synchrotron X-ray Diffraction (S-XRD) reveals the marginal variation in the structure having the lattice parameters of 8.4364 Å for ZF, 8.4176 Å for ZF1 and 8.4187 Å for ZF2. The porosity after laser irradiation has been increased to 10.87% for ZF1 and 10.84%, for ZF2 from 10.28% for ZF. The blocking temperature (T_B) has been ~ 15 K for all samples. There had been a slight variation in the magnetization of irradiated pellets at 5 and 300 K compared to ZF. The separation between ZFC and FC curves, the measure of interaction between Fe ions has increased for irradiated pellets when compared with the separation for ZF. Moreover, magnetization (M) versus applied magnetic field (H) at 5 K in the range of ± 1 T shows the ferrimagnetic behaviour and this ordering has been seen up to T_B as visible from M - T curves, whereas the material becomes superparamagnetic above T_B as observed from M - T & M - H measurements.

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