Abstract

Mechanically polished and annealed Fe-1.0 wt.% Cu alloy specimens of dimension (15 mm × 15 mm × 0.5 mm) were irradiated in vacuum ~ 10^{-3} Torr with Nd:YAG laser (λ = 532 nm, E = 50 mJ, τ = 6 ns) at a repetition rate 10 Hz. The number of laser shots was varied from 250 to 2500. The laser fluence and laser intensity at the laser irradiation spot on the target surface were 86.54 J/cm^2 and 14.4 ×10^9 W/cm^2, respectively. Surface morphology of laser-treated specimens was examined by optical microscope. Heat affected area was found to increase exponentially with the increase in number of laser shots. The structural parameters like crystallite size, lattice strain, and dislocation line density were evaluated using x-ray diffraction technique. Four point probe technique and Vickers hardness tester were used for resistivity and hardness measurements, respectively. The electrical resistivity and surface hardness increases linearly with increasing number of laser shots. The hardness was found to increase up to 14% and electrical resistivity increases up to 256% on laser irradiation. A linear relationship between electrical resistivity and hardness was also observed. Both electrical resistivity and hardness were also found to have dependence on crystallite size.