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Study of the mechanical alloyed Fe-Ni and its magnetic properties

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In this study, Fe₅₀Ni₅₀ alloy powders were synthesized by mechanical alloying process using planetary high-energy ball mill (Pulverisette 5, Fritsch) for milling times: 2, 5, 10, 30, 50, 70 h and for the weight ratio of balls to powder (BPR) 30:1, under argon atmosphere. The alloy formation and different physical properties were studied as a function of milling time, using X-ray diffraction (XRD) technique, field emission scanning electron microscopy (FESEM), transmission electron microscopy (TEM), vibration sample magnetometer (VSM) and Fourier transform infrared (FTIR) spectroscopy. Increase in milling time led to reduction in crystallite size (*D*) in the super paramagnetic phase, thus inducing a higher magnetization to about 120 emu g⁻¹, which is significantly higher compared with the work of others. Also reduction in crystallite size led to lower coercivity. Optical studies showed that determined grain size based on hysteresis curve for 70 h of milling time is in the same order of radiation wavelength.

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