

Unravelling magnetism and microstructure in SmCo₅/Fe composites

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Magnetic nanocomposites SmCo₅/Fe were synthesized by high energy ball milling (HEBM) from SmCo₅ and 10 wt.% of α -Fe powders over various time up to 10 h. The X-ray diffraction patterns revealed dominated hexagonal 1:5 phase, the cubic α -Fe phase and 2:17 rhombohedral phase, all content modified over synthesis duration. By analysing XRD patterns, the significant decrease of crystallites size with simultaneous increase of lattice straining is confirmed. An evident reduction of particles size is noted from the microstructural analysis. The observed non-linear modification of magnetic parameters determined from hysteresis loops may be considered as the modification within the exchange-coupling strength induced by various synthesis time. The modification of the maximum energy product $(BH)_{max}$ is discussed. The room temperature Mössbauer spectra confirmed the magnetic character of Fe.