

Morphology, structural and microstructure parameters of Fe nanoparticles synthesized by evaporation-condensation and mechanical alloying

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Fe nanoparticles were investigated in this work, we present the experimental results obtained on the Fe powder produced by evaporation-condensation and mechanical alloying in two mills: Vibratory (Spex 8000 M) and Planetary (P7). Powder X-ray diffractometry (XRD), transmission electron microscopy (TEM), scanning electron microscopy (SEM), are applied to characterize the composition, morphology, crystal structure, atomic order of the nanoparticles. The crystallite size, lattice strain and fraction of the phase have been calculated by Rietveld refinement method.

Observation with a transmission electron microscopy TEM shows that the particles are generally spherical and arranged in chains or in the form of aggregates. The average size of the nanoparticles, which in the order of 13 nm.

The changing parameters from refinements of the diffraction patterns of the Fe powder (crystallite size, lattice parameter, micro-strain) prepared by two types of mills Spex 8000M and P7, followed by X-ray diffraction, are calculated from Maud. The microstructural parameters change very rapidly in the early hours of milling and tend for longer milling time to stationary values.