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MICROSTRUCTURAL ANALYSIS ANDPHASE TRANSFORMATION IN NANOSTRUCTUREDFe POWDERS

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Abstract : One of the most efficient approaches for preparing nanostructured materials is mechanical milling. It has frequently been applied in synthesizing nanocrystalline metals, alloys and intermetallics [1– 3]. The MA process which introduces severe plastic deformation into powder particles can refine the grain size down to the nanometer scale for most metals and alloys. The obtained nanostructured powders consist thus of particles composed of nanometer size crystalline grains linked to each other through GBs. The structure of GBs, which has been controversially debated, behave as heterogeneous and partially disordered systems with a significant fraction of atoms residing in defect environments (GBs, surfaces, etc.). Nanostructured Fe powders were obtained by ballmilling in a high-energy planetary ball mill P7 under argon atmosphere using hardened steel containers and balls. The rotation speed was 400 rpm and the ball-to-powder weight ratio was 20:1. Microstructural evolution during the milling process was followed by X-ray diffraction (XRD). The X-ray diffraction patterns were analysed by using the Maud program which is based on the Rietveld method [4]. Differential scanning calorimetry (DSC) measurements were carried out using a universal Genessus 6000 differential scanning calorimeter within the temperature range 293–1273 K at a continuous heating rate of 10 K min

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