

Synthesis of Nano-crystalline Pyrite FeS₂ By Mechanical Alloying: Structural, Microstructural, Hyperfine and Optical Investigations.

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Description

Nanostructured pure FeS₂ (Pyrite) powders have been prepared from metallic iron and sulphur, using high energy planetary ball-mill. Changes in structural, morphological, hyperfine and optical properties of the powders during mechanical alloying have been examined by X-ray diffraction, scanning electron microscopy, Fe Mossbauer spectroscopy and spectrophotometry. Reducing the reaction time was challenged by optimizing milling speed and milling intervals duration. This attempt was successfully achieved down to 12 h for obtaining pure pyrite phase. Its lattice parameter has been found to increase up to 5.460(3 Å) after 72 hours of milling in relation with the growing creation of defects in the structure. After 24 hours milling, crystallite size saturates around 60 nm while root-mean-square strain exhibits small fluctuations around 0.07 %. The powder microstructure has the aspect of agglomeration of refined micro ...