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Synthesis and characterization of FeSe nanoparticles obtained by high-energy ball milling.

Recently enough attention was given to iron selenide because of the unusual structure and electronic properties of transition metal chalcogenides. Iron selenide system presents two homogeneous and stable phases, α-FeSe and FeSe2, and a variety of structures. Fe-Se compound attracts more and more attention due to its wide application in optical electronic, photovoltaic and solar cell. Several methods have been attempted to prepare the iron selenide. In all these methods, enormous amount of energy is required for materials formation and is time consuming. In addition, when there is a large difference in the melting points of constituents iron (1535℃) and selenium (217℃), it becomes difficult to obtain FeSe compound with desired stoichiometry by these techniques.
The mechanical alloying (MA) method has been considered the most powerful tool for nanostructured materials, and it provides numerous advantages, because of its simplicity, relatively inexpensive equipment.
Morphological, structural and thermal changes during milling were analyzed by scanning electron microscopy coupled with EDAX microanalysis, X-ray diffraction and differential scanning calorimetry (DSC). For the samples milled between 10 and 20 h, the orthorhombic FeSe2 and β-FeSe hexagonal nanometric phases are formed and the volume fraction of the α-Fe phase decreases. For 33 and 52 h of milling, the α-Fe phase is completely gone and the emergence of new phase, also in nanometric scale, a typical of Fe7Se8 phase.

Choix de session parallèle

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