High Temperature Phase Transformation of Iron Sulfide

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Abstract

Iron sulfide materials contain complex solid phase structures and various properties that play a crucial role in recent investigations. Although the iron-sulfur system is a binary system, its phase relationships are complicated due to the different valency states taken by sulfur (disulfide, mono sulfide) and iron (ferric, ferrous). Because of the complex structure of iron sulfide compound, a small variation in stoichiometry can lead to huge changes in their properties. In this report, iron sulfide nanoparticles have been synthesized employing high temperature route. The structural properties observed from X-ray diffraction (Figure 1) measurements strongly revealed that the properties of the as-prepared nanostructured nanocrystals are dependent on the synthesis conditions such as temperature. The reaction temperature played a critical role in controlling the chemical composition, crystalline structure and magnetic properties of the as-synthesized iron sulfide nanocrystals. It is also observed that, the temperature affects the mechanism of the formation of these complex structures of iron sulfide nanocrystals. The sizes of the crystals calculated from Scherrer equation, lattice constants and d-spacings showed that increasing temperature resulted in a general increase of lattice constant, d-spacing and Scherrer sizes.

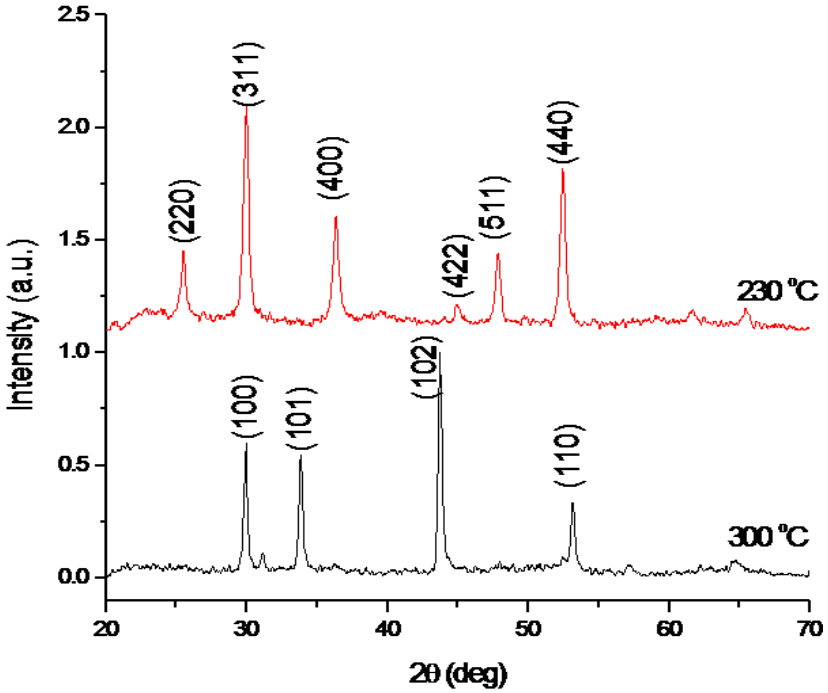

Figure 1. Powder X-ray diffraction (pXRD) pattern of iron sulfide nanoparticles