

Phase transformation of iron oxide–silica coreshell structure during differential scanning calorimetry and pulsed electric current sintering processes: A comparison

Abstract

This paper discusses the phase transformation of iron oxide nanoparticles inside the silica spheres during high temperature differential scanning calorimetry (DSC) in argon and pulsed electric current sintering (PECS) compaction in vacuum. The maximum temperature used was 1323 K. In both cases it was found that the iron oxide nanoparticles were reduced depending on the heating atmosphere. Results suggested that during DSC heating in argon, the silica matrix acted as a reducing agent for iron oxide nanoparticles, while in PECS, the reduction of iron oxide nanoparticles was caused by the reducing environment created during the sintering at high temperature, and resulted also in crystallization of the silica matrix.