

Influence of sintering temperature on the properties of pulsed electric current sintered hybrid coreshell powders

Abstract

The influence of pulsed electric current sintering (PECS) temperature on the properties of bulk materials consolidated from three different types of hybrid powders have been studied. These powders consisted of iron oxide–silica coreshell structure, silver doped iron oxide–silica coreshell structure and, silver doped silica. The powders were prepared using a modified Stöber method. The sintering temperature was varied from 873 K up to 1273 K and sintering pressure and time were 50 MPa and 15 min respectively. Porous structures were obtained with relative densities from about 58 to 68%. Sintering temperature induced the growth of silver nanoparticles on the silica surfaces. Oxidation of the iron oxide during the compaction was affected by thermal decomposition of silver oxides. Sintering temperature changed the magnetic properties of iron oxide compacts via crystallite growth and oxide transformation. At temperature higher than 1173 K, iron oxide was reduced into pure iron (α -Fe).

Keywords; Sintering, Silver, Iron oxide, SiO₂, Phase transformation