

Preparation and Characterization of Metal-Ceramic Nanocomposite for High Frequency Application

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In order to use magnetic materials for the electronic or electromagnetic systems in several gigahertz frequency ranges, their magnetic properties such as saturation of magnetization, and relative permeability must be enhanced further.

Among various soft magnetic materials, transition metals (Fe, Co, and Ni) have been conventionally used for relatively high frequency system applications. However, these materials cause high energy losses in several gigahertz frequency ranges, so limit their applications. In addition to energy loss problem, oxidation also degrade magnetic properties. Therefore, effective insulation of the materials have become a solution in this situation. In this study, we synthesized metal particles insulated with ceramics by following steps. First, we synthesized metal oxide/ceramic nanocomposites powders through ultrasonic spray pyrolysis. Then the synthesized oxide powders were reduced by hydrogen reduction. Consequently, metal nanocomposites insulated with ceramics are fabricated. The effects synthesis parameters on magnetic properties of nanocomposites was also discussed.

Keywords: Soft magnetic material, Metal-Ceramic composite, Electrical insulation, Ultrasonic spray pyrolysis, Gigahertz frequency.