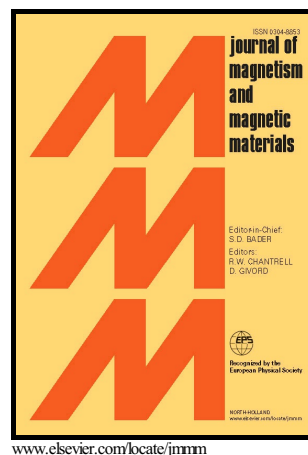


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Effect of starting solution acidity on the characteristics of CoFe_2O_4 powders prepared by solution combustion synthesis

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Abstract

Cobalt ferrite (CoFe_2O_4) nanoparticles were synthesized at the different pH values of starting solution, adjusted by NH_4OH , using solution combustion method. Theoretical calculations and Fourier transform infrared spectroscopy analysis were carried out for determination and controlling the chelated species in solution. The phase evolution, surface area, morphology and magnetic properties of the combusted CoFe_2O_4 powders have been investigated by thermal analysis, X-ray diffractometry, electron microscopy, adsorption-desorption and vibrating sample magnetometer. The combustion rate mainly depends on pH which affects the phase and crystallite size. Furthermore, the specific surface area of the porous CoFe_2O_4 powders decreases from 66.25 to 27.09 m^2/g by the increase of pH from 2 to 10. The combusted CoFe_2O_4 powders exhibit ferromagnetic properties which the highest saturation magnetization of ~ 63.7 emu/g was achieved at pH of 2. Furthermore, the coercivity increases from 1112 to 1225 Oe by the increase of pH due to the decreasing of crystallite size.

Keywords

Cobalt ferrite; Solution combustion synthesis; Acidity; Magnetic property;

1. Introduction

Combustion synthesis which also known as self-propagating high-temperature synthesis (SHS) is an effective energy saving and low-cost method for production of various advanced materials [1-3]. The initial heterogeneous mixture in combustion synthesis is ignited by an external thermal source which leads to propagation of a rapid high-temperature (1000–3000 °C) reaction wave in

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