Nanocomposites and nanomaterials

Synthesis and Characterization of $ZnCr_2O_4$ Spinel-type Nanostructures by Sol-Gel Auto-Combustion Method

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Magnetic spinel-type nanoparticles (NPs) are widely used in modern technologies such as electronics, chemical engineering, industry, etc. In particular zinc chromite is promising nanomaterial for humidity sensors, photocatalysts, toxic gases detecting sensors and other novel device fabrication.

Various methods of synthesis of spinel NPs were applied for zinc chromite obtaining, including mechanical activation, high-temperature solid-state reaction, micro-emulsion method, solution method and spray pyrolysis. Sol-gel auto-combustion method is an easy to implement for high quality NPs obtaining. However, the proper choice of the combustion agent, synthesis route and precursor and the knowledge of its composition and structure are crucial to make a pure product.

We selected sol-gel method [1] for improving of $ZnCr_2O_4$ NPs synthesis and next investigated their morphology, optical properties, and phase transitions by differential thermal analysis. The tartaric acid combustion agent and equimolar amount (1:2) of Zinc acetate dehydrate and Chromium nitrate as ion-source were used. The post-combustion treatment for a five-hour at 500 °C realized to remove residual organic compounds. Optical properties of aqueous solutions are consistent with the published data for $ZnCr_2O_4$ [2]. The temperature of auto-combustion and correspondent endothermic and exothermic effects parameters for our sample were determined based on differential thermal analysis (DTA).

1. *Rida K., Benabbas A., Bouremmad F., Pen M., Martınez-Arias A.* Influence of the synthesis method on structural properties and catalytic activity for oxidation of CO and C_3H_6 of pirochromite $MgCr_2O_4$// Applied Catalysis A: General. -2010.-**375**.-P. 101–106.

2. *He H. Y.* Catalytic and photocatalytic activity of $ZnCr_2O_4$ particles synthesised using metallo-organic precursor// Materials Technology. -2008.-**23**.-P. 110–113.