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Synthesis and characterization of nanosized $ZnFe_2O_4$ powders obtained by sonochemistry

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Zink ferrite powders are widely studied due to their application in many fields, such as anode materials for lithium-ion batteries, gas sensors, magnetic materials, catalytic materials, and antibacterial materials in water treatment. We present the structural and magnetic properties of nanosized $ZnFe_2O_4$ powders synthesized by sonochemistry and discuss their dependence on the synthesis conditions. The XRD spectra of the as-prepared samples reveal the presence of both an amorphous and a crystalline $ZnFe_2O_4$ phase. In the spectrum of the sample annealed at 500 °C, the peaks are considerably narrower and of higher intensity, proving the sample's higher degree of crystallinity. The room temperature Mössbauer spectra of the as-prepared and annealed $ZnFe_2O_4$ samples showed a superparamagnetic doublet spectrum. Both kinds of samples exhibited paramagnetic behavior at room temperature, which is typical of the normal spinel structure. A very narrow hysteresis curve at 4.2 K was recorded, which could be expected for superparamagnetic particles in the ferrimagnetic state at low temperatures.

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Primary authors: Ms GEORGIEVA, Borislava (Institute of Electronics, Bulgarian Academy of Sciences, 72 Tsarigradsko Chaussee, 1784 Sofia, Bulgaria); Dr KOLEV, Svetoslav (Institute of Electronics, Bulgarian Academy of Sciences, 72 Tsarigradsko Chaussee, 1784 Sofia, Bulgaria, Neofit Rilski South-Western University, 66 Ivan Mihailov Str., 2700 Blagoevgrad, Bulgaria); Prof. KREZHOF, Kiril (Institute of Electronics, Bulgarian Academy of Sciences, 72 Tsarigradsko Chaussee, 1784 Sofia, Bulgaria); Dr TRAN, Lan Maria (Institute of Low Temperature and Structure Research, Polish Academy of Sciences, ul. Okólna 2, 50-422 Wrocław, Poland); Dr BABIJ, Michał (Institute of Low Temperature and Structure Research, Polish Academy of Sciences, ul. Okólna 2, 50-422 Wrocław, Poland); Dr MAHMOUD, Abdelfattah (Greenmat, Chemistry Department, University of Liege, 11 allée du 6 août, 4000 Liège, Belgium); Mr CLOSSET, Raphael (Greenmat, Chemistry Department, University of Liege, 11 allée du 6 août, 4000 Liège, Belgium); Prof. VERTRUYEN, Benedicte (Greenmat, Chemistry Department, University of Liege, 11 allée du 6 août, 4000 Liège, Belgium); Dr BOSCHINI, Frederic (Greenmat, Chemistry Department, University of Liege, 11 allée du 6 août, 4000 Liège, Belgium); Dr BOHRA, Murtaza (École Centrale School of Engineering (MEC), Mahindra University, Hyderabad 500043, India); Prof. KOVACHEVA, Daniela (Institute of General and Inorganic Chemistry, Bulgarian Academy of Sciences, Acad. Georgi Bonchev Str., bld. 11, 1113 Sofia, Bulgaria); Mr GHELEV, Chavdar (Institute of Electronics, Bulgarian Academy of Sciences, 72 Tsarigradsko Chaussee, 1784 Sofia, Bulgaria); Dr KOUTZAROVA, Tatyana (Institute of Electronics, Bulgarian Academy of Sciences, 72 Tsarigradsko Chaussee, 1784 Sofia, Bulgaria)

Presenters: Ms GEORGIEVA, Borislava (Institute of Electronics, Bulgarian Academy of Sciences, 72 Tsarigradsko Chaussee, 1784 Sofia, Bulgaria); Prof. KREZHOF, Kiril (Institute of Electronics, Bulgarian Academy of Sciences, 72

Tsarigradsko Chaussee, 1784 Sofia, Bulgaria)

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