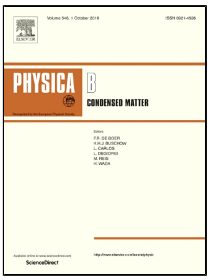
Accepted Manuscript



Spinel Ferrite Magnetic Nanostructures at the Surface of Graphene Sheets for Visible Light Photocatalysis Applications

Majid Mahmood, Muhammad Asif Yousuf, Mirza Mahmood Baig, Muhammad Imran, Muhammad Suleman, Muhammad Shahid, Muhammad Azhar Khan, Muhammad Farooq Warsi

PII:	S0921-4526(18)30534-9
DOI:	10.1016/j.physb.2018.08.043
Reference:	PHYSB 311030
To appear in:	*Physica B: Physics of Condensed Matter*
Received Date:	12 August 2018
Accepted Date:	24 August 2018

Please cite this article as: Majid Mahmood, Muhammad Asif Yousuf, Mirza Mahmood Baig, Muhammad Imran, Muhammad Suleman, Muhammad Shahid, Muhammad Azhar Khan, Muhammad Farooq Warsi, Spinel Ferrite Magnetic Nanostructures at the Surface of Graphene Sheets for Visible Light Photocatalysis Applications, *Physica B: Physics of Condensed Matter* (2018), doi: 10.1016/j.physb.2018.08.043

Spinel Ferrite Magnetic Nanostructures at the Surface of Graphene Sheets for Visible Light Photocatalysis Applications

Majid Mahmood[a], Muhammad Asif Yousuf[a], Mirza Mahmood Baig[a], Muhammad Imran[a], Muhammad Suleman[b], Muhammad Shahid[a,c], Muhammad Azhar Khan[d] , Muhammad Farooq Warsi*[a]

[a]Department of Chemistry, The Islamia University of Bahawalpur, Bahawalpur-63100, Pakistan

[b]Department of Agricultural Chemistry, The University of Agriculture, Peshawar, Pakistan

[c]Department of Chemistry, University of Hafr Al Batin, Saudi Arabia

[d]Department of Physics, The Islamia University of Bahawalpur, Bahawalpur-63100, Pakistan

Corresponding author: farooq.warsi@iub.edu.pk, Phone: +92 62 9255473

Abstract

In this work erbium (Er^{3+}) substituted cobalt zinc ferrite having general formula $Co_{0.70}Zn_{0.30}Er_xFe_{2-x}O_4$ (x = 0, 0.01, 0.02, 0.03, 0.04, 0.05) were fabricated using micro-emulsion technique. The substitution of Er was done for the purpose of tuning the optical band gap. Er^{+3} substituted nanoparticles were annealed at 700 ^{0}C for 7 hours. A typical composition of $Co_{0.70}Zn_{0.30}Er_xFe_{2-x}O_4$ was utilized to make the nanocomposites material with reduced graphene oxide (rGO), that was prepared by facile chemical route. **The main purpose of graphene was to enhance the conductivity of ferrite particles.** All these ferrite particles and a composite were characterized by X-rays diffraction (XRD), UV-Visible spectroscopy and SEM for structural elucidation and morphology studies. Single phase spinel structure was confirmed by XRD analysis and crystallized size calculated by Scherer formula was found in the range 35 to 60 nm. SEM confirmed the well dispersed ferrite particles among graphene sheets. All the Er-substituted ferrite particles were subjected to dielectric parameters study. One typical composition of