Author's Accepted Manuscript

www.elsevier.com/locate/matlet

Innovative one pot synthesis method of the magnetic zinc ferrite nanoparticles with a superior adsorption performance

Azadeh Tadjarodi, Mohammad Salehi, Mina Imani

PII: S0167-577X(15)00380-8
DOI: http://dx.doi.org/10.1016/j.matlet.2015.03.016
Reference: MLBLUE18608

To appear in: *Materials Letters*

Received date: 12 January 2015
Accepted date: 6 March 2015

Cite this article as: Azadeh Tadjarodi, Mohammad Salehi, Mina Imani, Innovative one pot synthesis method of the magnetic zinc ferrite nanoparticles with a superior adsorption performance, *Materials Letters,* http://dx.doi.org/10.1016/j.matlet.2015.03.016

Innovative one pot synthesis method of the magnetic zinc ferrite nanoparticles with a superior adsorption performance

Azadeh Tadjarodi*, Mohammad Salehi, Mina Imani,

Research Laboratory of Inorganic Materials Synthesis, Department of Chemistry, Iran University of Science and Technology, Narmak, Tehran, 16846-13114, Iran

* Corresponding Author: Email: tajarodi@iust.ac.ir

Abstract

A convenient strategy for preparing a single phase of crystalline zinc ferrite nanoparticles assisted by microwave heating approach is reported. This technique involves a one-pot solid state reaction of self-combustion using glycine as fuel, ammonium nitrate as driving agent and metal nitrates as reactants in a designed reaction set-up. The set-up has been manufactured from an alumina crucible encircled by a jacket of CuO as microwave absorbing layer. This work-piece absorbs microwaves and creates the calcination conditions without any external heat source. The reactions were operated with a power of 900 W for 20 min. The results revealed the successful synthesis of magnetic $ZnFe_2O_4$ nanoparticles with the average particle size of 32 nm with a Langmuir surface area of 82.13 $m^2\ g^{-1}$. The adsorption performance of the as-prepared product for water purification from colored pollutants was also discussed in detail.

Keywords: Nanoparticles; Magnetic materials; Powder technology; Zinc ferrite; Microwave.

1. Introduction

Due to fact-growing demands for the synthesis of various nanomaterials, the discovery of simple, quick, low cost and high efficient strategies has aroused many scientific efforts. Amongst nanomaterials, magnetic spinel ferrites, MFe_2O_4, have been introduced as an important class of nanomaterials due to their magnetic, catalytic and opto-electrical properties [1, 2]. The most of the described syntheses in literature show that the pure phase preparation of ferrites require to a high temperature of calcination, severe experimental conditions and or complex equipments [3]. Among reported methods such as co-precipitation [1], hydrothermal/solvothermal [4], mechanochemical [5], sol-gel [6] *etc.,* combustion technique assisted by microwave energy has attracted a lot of attention due to its simplicity, cost effective and short time [7]. However this technique is simple and quick, the sintering or calcining post-reaction and the supply of enough energy for this process is appeared to be an important challenge [8]. On the other hand, the single-phased structure of $ZnFe_2O_4$ with a fascinating performance can be an important candidate in the practical