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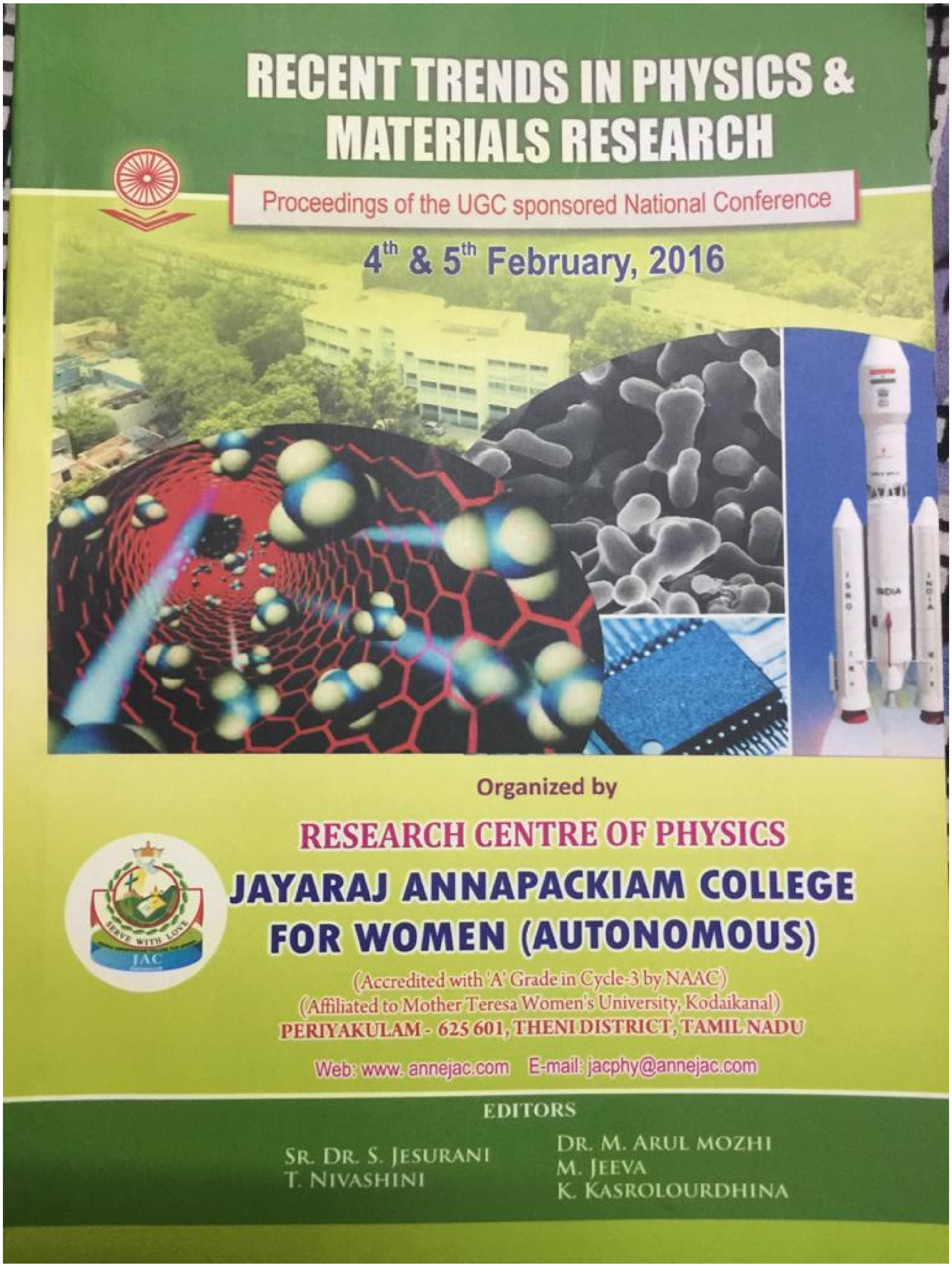

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Investigation on the structural and morphological behaviour of solvothermally synthesised Ferrite Nanoparticles

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Abstract

This work reports the development of ferrite MFe_2O_4 (M= Fe, Zn, Mn) particles with a diameter about 100 - 400 nm by a simple template-free solvothermal reduction route in Ethylene glycol (EG) solution. The formation mechanism and properties of the prepared materials have been studied. The cubic spinel structure of prepared ferrite nanostructures was confirmed from the X-ray diffraction patterns (XRD) and Fourier transform infra red spectroscopy (FTIR). The morphology and the chemical composition were investigated through the Scanning electron microscopy (SEM), Energy dispersive X-ray spectroscopy (EDAX) Transmission electron microscopy (TEM). Every magnetic microsphere is made up of many ultrafine MFe_2O_4 nanoparticles. This approach has provided a simple, single step, general, and inexpensive method for the preparation of monodisperse magnetic microspheres with a tunable diameter size. These prepared materials may be effectively used as catalyst for electrochemical and photochemical applications.

INTRODUCTION

Nanomaterials have emerged as active area of interest among researchers because of their distinctive physical and chemical properties, such as high surface area, catalytic effect, mass transport and the quantum size effect [1]. Recent years have witnessed an upsurge in the exploration of spinel nanoferrites (MFe_2O_4) because of their useful magnetic and electrical properties for technological applications in diverse fields such as ferrofluids, magneto-optics, spintronics, medical diagnostics, information storage systems, microwave absorbers and the manufacture of anodes for batteries [2]. It is well known that the magnetic and electrical properties of MFe_2O_4 nanoparticles can be varied by changing the identity of the divalent M^{2+} cation or by partial substitution, while maintaining the basic crystal structure. Additionally, their physicochemical properties, which are different from the corresponding bulk materials can be tuned by effects of the morphology and assembly of MFe_2O_4, their size and