Selective oxidation of styrene to benzaldehyde using aluminium doped nano barium hexaferrite, synthesized by sol-gel auto-combustion method

Mukesh Suthar and P. K. Roy #

Indian Institute of Technology (BHU), Varanasi – 221005, India.
Email: pkroy.cer@itbhu.ac.in

Abstract: Magnetic materials are extensively used as crucial components for a large multiplicity of industrial and technological applications. In the modern catalysis research particularly in organic synthesis, reusability and retrieval of catalysts is a significant feature. Compared to the unadventurous methods of separation, magnetic separation has established as a highly efficient, easy and rapid separation method for catalysts from its reaction mass. Barium Hexaferrite nanoparticles are well-known material, recognized as a hard ferrite with its preferred plane of magnetization perpendicular to the c-axis at room temperature, and these nanoparticles can be used as both catalyst and adaptable provision for functionalization of metals.

In the present work, the magnetic properties and catalytic properties of the aluminium doped Barium Hexaferrite nanoparticles are discussed. The Sol-gel auto-combustion technique was employed for the preparation of thisnano-hexaferrite catalyst. The crystallinity and phase purity of synthesized ferrite nanoparticles were confirmed by the X-ray diffraction technique. The magnetic properties of the prepared ferrite nanoparticles were studied by SQUID based VSM technique at room temperature. The catalytic studies of the prepared ferrite catalyst were carried for the synthesis of Benzaldehyde, using styrene as a precursor in the presence of methanol: Water (2:3) and THF. These catalytic activities of the ferrite nanoparticles were recorded for this reaction and catalyst could be recovered easily by applying an external magnetic field.

Keywords: Ferrite, Catalyst, Dehydrogenation, Oxidation, Alkylation, THF

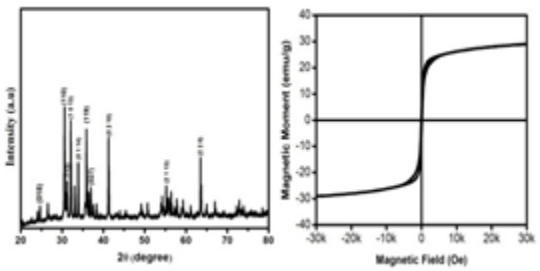

Figure 1: X-Ray diffraction pattern and M-H curve for aluminium doped barium hexaferrite synthesized via sol-gel autocombustion.

References:

1. Robert C. Pullar, Hexagonal ferrites: A review of the synthesis, properties and applications of hexaferrite ceramics, Progress in Materials Science 57 (2012) 1191–1334.

5th International Conference on Nanotechnology for Better Living (NBL-2019), Jointly organized by National Institute of Technology (NIT) Srinagar and Indian Institute of Technology (IIT) Kharagpur; April 7 – 11, 2019 at SKUAST, Shalimar Srinagar, Jammu and Kashmir, India; Editor: Dr. M. A. Shah and Prof. P. Banerji, ISBN:978-81-939516-0-6; Published by Applied Science Innovations Pvt. Ltd., Pune, Maharashtra, India.

2. S.M. El-Sayed et al., Magnetic behavior and dielectric properties of aluminum substituted M-type barium hexaferrite , Physica B 426 (2013) 137–143.
3. Ravindra Y. Pawar, Satish K. Pardeshi, Selective oxidation of styrene to benzaldehyde usingsoft $BaFe_2O_4$ synthesized by citrate gel combustion method, Arabian Journal of Chemistry (2018) 11, 282–290.

5th International Conference on Nanotechnology for Better Living (NBL-2019), Jointly organized by National Institute of Technology (NIT) Srinagar and Indian Institute of Technology (IIT) Kharagpur; April 7 – 11, 2019 at SKUAST, Shalimar Srinagar, Jammu and Kashmir, India; Editor: Dr. M. A. Shah and Prof. P. Banerji, ISBN:978-81-939516-0-6; Published by Applied Science Innovations Pvt. Ltd., Pune, Maharashtra, India.