4th National Seminar on
Technologically Important Crystalline and Amorphous Solids (TICAS-2018)

2nd & 3rd March 2018

Department of Physics & International Research Centre (IRC)

PROCEEDINGS

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Anand Nagar, Krishnankoil - 626 126.
Srivilliputtur (Via), Virudhunagar (Dt), Tamil Nadu, India

March 2018

ISBN 978-81-909237-3-6

Published by
Department of Physics, School of Advanced Sciences
Kalasalingam Academy of Research and Education, Krishnankoil – 626 126, Tamilnadu

SYNTHESIS AND CHARACTERIZATION OF GAMMA IRRADIATION OF CuO NANO PARTICLE

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Abstract

In the development of nano size materials of metal oxides particles are intensively followed because of their applications in science and technology. All the transition metal oxides like copper oxide (CuO) are a potential candidate for magnetic storage devices, radiation sensors, and super capacitors and especially it acts as a good catalyst in some of the chemical reactions. The CuO metal oxides have been prepared by sol gel method. The obtained CuO metal oxide powders were irradiated with gamma ray of dose rate 11 gray per minute. The radiation induced changes in the structural , morphological and optical properties of CuO nano particles was analyzed with X-ray diffraction (XRD), Scanning electron microscope (SEM) Ultra violet -Visible spectroscope (UV-Vis), and Fourier transform infrared spectroscope (FT-IR). The XRD spectrum shows that the crystalline nature of sample is still present after irradiation and the corresponding 2θ values are shifted to higher side and the particle size will be increasing from 28.42nm to 51.03 nm. The morphological changes due to the gamma irradiation were confirmed by SEM images. The UV absorption spectra revealed the absorption edge and the corresponding band gap values were correlated. The FTIR spectrum shows the vibrational modes are changing as a result of irradiation.

Keywords: CuO, sol gel method, gamma irradiation, Optical properties.

1. Introduction

Nanomaterials are very different from bulk materials and isolated molecules because of their unique properties such as optical, electronic and chemical [1, 2]. Metal oxide nanoparticles belong to a family of nano materials that have been manufactured on a large scale for both industrial and household applications, and they hold promise for future applications [3, 4]. In the world there is a number of metal oxides are available in nature but some of the metal oxides are most useful in accordance with their applications of day to day life in science and technology.

CuO is the useful metal oxide and has so many applications in different areas. It is a *p*-type metal oxide semiconductor with promising applications in solar energy conversion and catalysis [5-8]. Nanoparticles of CuO can be used as gas sensors, optical switch, and magnetic storage media owing to its photoconductive and photochemical properties [9]. Furthermore it is a promising semiconductor for solar cell fabrication due to its suitable optical properties. Studying quantum confinement effects or modifying the behavior of the direct forbidden band gap is very challenging [10-11].The unique property of CuO is it acts as a good semiconductor. Semiconductor materials have been particularly interesting because of their great practical importance in electronic and optoelectronic devices.

Due to the potentiality of CuO, it acts as a good catalyst. In nano range CuO is act as super capacitors in the field of electrical applications and it has the wide band gap nearly equal to ZnO. This makes it useful for solar energy conversion. CuO can be used as coolant material and it will depend mostly on the nano powder material size, morphology and specific surface area of the prepared materials. On the basis of surface to volume ratio nano materials are separated from bulk materials [12]. In nano scale preparation we observed that the size quantization effects will have lot of influence on the material properties.

In the present study the effect of gamma irradiation on the structural, optical properties of CuO metal oxides nano particles were studied. It shows that distinct structural, vibrational bonding and optical characteristics. It can change the properties of materials in the applications of different fields in radiation science.

2. Experimental

There are wide variety of preparation methods are available for the synthesis of CuO nanoparticles [13] Among these methods our preparation method for the synthesis of CuO nanoparticles belongs to chemical method, i.e