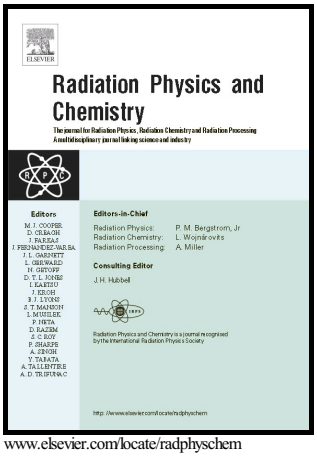
Author's Accepted Manuscript

Study on Copper – Fullerene Nanocomposites Irradiated by 120 MeV Au Ions

Rahul Singhal, Satakshi Gupta, Ritu Vishnoi, D. Singh, Ganesh D. Sharma



www.elsevier.com/locate/radphyschem

PII: S0969-806X(18)30335-9
DOI: https://doi.org/10.1016/j.radphyschem.2018.06.048
Reference: RPC7923

To appear in: *Radiation Physics and Chemistry*

Received date: 16 April 2018
Revised date: 3 June 2018
Accepted date: 25 June 2018

Cite this article as: Rahul Singhal, Satakshi Gupta, Ritu Vishnoi, D. Singh and Ganesh D. Sharma, Study on Copper – Fullerene Nanocomposites Irradiated by 120 MeV Au Ions, *Radiation Physics and Chemistry,* https://doi.org/10.1016/j.radphyschem.2018.06.048

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Study on Copper – Fullerene Nanocomposites Irradiated by 120 MeV Au Ions

Rahul Singhal[1*], Satakshi Gupta[1], Ritu Vishnoi[1], D. Singh[1], Ganesh D. Sharma[2]

[1]Department of Physics, Malaviya National Institute of Technology, JLN Marg, Jaipur 302017 (Rajasthan), India

[2]Department of Physics, The LNM Institute of Information Technology, Jaipur 302031, India

*Corresponding author. Tel number: +919549654378. (R. Singhal, Email: rsinghal.phy@mnit.ac.in)

Abstract

We report the swift heavy ion irradiation induced tailoring of structural properties of nanocomposite thin films of copper nanoparticles embedded in fullerene matrix. Cu metal nanoparticles with low metal concentration (~ 5 at. %) are deposited in fullerene C_{60} matrix. The thickness of the combined film is about 50 nm as revealed by Rutherford backscattering spectrometry. The absorbance of copper nanoparticles did not exhibit any characteristic plasmon resonance owing to low concentration of metal. The analysis of results of Raman spectroscopy demonstrated the structural transformation of fullerene to amorphous carbon at high fluence of 120 MeV Au beam. The formation of structures such as carbon nanowires as a result of irradiation has been revealed by FESEM micrographs. TEM results confirm the formation of small size copper nanoparticles in pristine film and growth of the Cu particles under the effect of swift heavy ions. I-V characteristics of metal-fullerene nanocomposite thin films give a clear indication that the value of resistance decreases due to effects of increasing fluence of ion irradiation.

Keywords: Copper nanoparticles, swift heavy ion irradiation, fullerene.

1. INTRODUCTION

Ever since the discovery of nanoparticles the scientific community has been intrigued by their diverse properties and numerous applications in fields like optoelectronics, catalysis, sensors, biomedical, electronics and other related fields (Colvin et al. 1994, Maier et al. 2001, Wunder et al. 2010, Ensign et al. 2004, Taton et al. 2000, Masoori et al. 2007). In particular, metal nanoparticles like silver, gold, platinum, titanium, copper arouse great interest due to their versatile properties (Lue 2001, Qazi & Javaid 2016, Zheng et al. 2006). Copper nanoparticles mark their importance with remarkable physical, chemical, electrical, optical, biological properties such as high stability, catalysis agent, high conductivity, strong absorbance, antibacterial action (Khanna et al. 2007, Eastman et al. 2001). Nanoparticles owe their improved properties over their bulk counterparts to the nanoscale size. Thus, these properties are dependent upon the size and shape of nanoparticles (Jin et al. 2003, Hoover et al. 2006) and inter-particle

Accepted manuscript

Download English Version:

https://daneshyari.com/en/article/8251281

Download Persian Version:

https://daneshyari.com/article/8251281

Daneshyari.com