Synthesis and Characterization of Cadmium Chalcogenide Semiconductor Quantum Dots Based Thin Film

By: Alvi, MA (Alvi, M. A.)[1] ; Al-Ghamdi, AA (Al-Ghamdi, A. A.)[1] ; Zulfequar, M (Zulfequar, M.)[2]

JOURNAL OF NANOELECTRONICS AND OPTOELECTRONICS
Volume: 11 **Issue:** 5 **Pages:** 656-661
DOI: 10.1166/jno.2016.1938
Published: OCT 2016
View Journal Impact

Abstract

Quantum dot solar cell is turned out to be the highly interesting subject of study for the next generation solar cells. The quantum dots (QDs) offer the impressive ability to harvest sunlight, beneficial features of photo stability, large molar extinction coefficients, dimension dependent optical properties and small expenses. The present work describes the synthesis and characterization of CdS chalcogenide semiconductor quantum dots. The CdS quantum dots with 6% and 10% PVA concentration were prepared by means of a sol-gel/spin coating method. The XRD studies show the amorphous nature of CdS quantum dot thin films. The HRTEM image shows the fringes of tiny dots with average sizes of 3-5 nm. The photoluminescence (PL) spectroscopy was examined with the excitation wavelength of 320 nm. The PL spectra depict a strong emission near 450 nm, corresponding to CdS band-edge emission. Raman spectra of CdS films were excited by the 632.4 nm line of an Ar ion laser. The characteristics Raman peak at 302 cm(-1) is obtained by CdS thin films, which is ascribed to CdS longitudinal optical (1LO) phonon. The CdS quantum dots follow the role of direct transition. It was observed that the optical band gap increases from 3.87 to 4.07 eV as PVA concentration increases from 6 to 10%. From dc conductivity measurement, the observed values of activation energy were found to increase from 0.89 to 1.03 with increasing PVA concentration from 6 to 10%.

Keywords

Author Keywords: Quantum Dots; Raman Spectroscopy; Optical Band Gap; dc Conductivity
KeyWords Plus: SENSITIZED SOLAR-CELLS; OPTICAL-PROPERTIES; ENHANCED PERFORMANCE; PHOTOVOLTAIC PERFORMANCE; CONVERSION EFFICIENCY; TIO2 FILM; CDS/CDSE; LAYER; TEMPERATURE; CDSE

Author Information

Reprint Address: Alvi, MA (reprint author)

+ King Abdulaziz Univ, Dept Phys, Jeddah 21589, Saudi Arabia.

Addresses:

+ [1] King Abdulaziz Univ, Dept Phys, Jeddah 21589, Saudi Arabia

+ [2] Jamia Millia Islamia, Dept Phys, New Delhi 110025, India

E-mail Addresses: alveema@hotmail.com

Funding

Funding Agency	Grant Number
Deanship of Scientific Research (DSR), King Abdulaziz University, Jeddah	141/130/1436-G
DSR	

View funding text

Publisher

AMER SCIENTIFIC PUBLISHERS, 26650 THE OLD RD, STE 208, VALENCIA, CA 91381-0751 USA

Categories / Classification

Research Areas: Engineering; Science & Technology - Other Topics; Physics

Web of Science Categories: Engineering, Electrical & Electronic; Nanoscience & Nanotechnology; Physics, Applied

Document Information

Document Type: Article

Language: English

Accession Number: WOS:000386520700017

ISSN: 1555-130X

eISSN: 1555-1318

Journal Information

Table of Contents: Current Contents Connect

Impact Factor: Journal Citation Reports

Other Information

IDS Number: EA3RB

Cited References in Web of Science Core Collection: 54

Times Cited in Web of Science Core Collection: 0