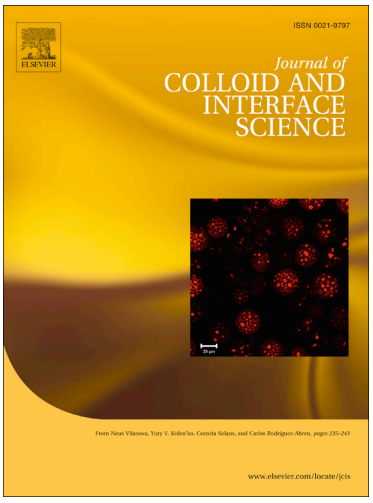

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Neha D. Desai, Kishorkumar V. Khot, Vishvanath B. Ghanwat, Suvarta D. Kharade, Popatrao N. Bhosale

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Surfactant Mediated Synthesis of Bismuth Selenide Thin Films For Photoelectrochemical Solar Cell Applications

Neha D. Desai[a,b], Kishorkumar V. Khot[a], Vishvanath B. Ghanwat[a], Suvarta D. Kharade[a], Popatrao N. Bhosale[a]

[a]Materials Research Laboratory, Department of Chemistry, Shivaji University, Kolhapur-416004, India

[b] Department of Chemistry, School of Science, Sanjay Ghodawat University, Kolhapur

Email id of corresponding author: nehadesai323@gmail.com

Abstract

In the present report, nanostructured bismuth selenide (Bi_2Se_3) thin films have been successfully deposited by using arrested precipitation technique (APT) at room temperature. The effect of three different surfactants on the optostructural, morphological, compositional and photoelectrochemical properties of Bi_2Se_3 thin films were investigated. Optical absorption data indicates direct and allowed transition with a band gap energy varied from 1.4 eV to 1.8 eV. The X-ray diffraction pattern (XRD) revealed that Bi_2Se_3 thin films are crystalline in nature and confirmed rhombohedral crystal structure.SEM micrographs shows morphological transition from interconnected mesh to nanospheres like and finally granular morphology. Surface topography of Bi_2Se_3 thin films was determined by AFM. Compositional analysis of all samples was carried out by energy dispersive X-ray spectroscopy (EDS). Finally, all Bi_2Se_3 thin films shows good PEC performance with highest photoconversion efficiency 1.47%. In order to study the stability of Bi2Se3 thin films four cycles are repeated after gap of one week each. Further PEC performance of all Bi_2Se_3 thin films are also supported by electrochemical impedance (EIS) measurement study.

Keywords:- ¸thin films, APT, effect of surfactant, 1.47 % PEC

1. Introduction:-

Today the main problem in front of society is energy crisis. To overcome this problem all scientific community is currently working on the renewable and sustainable energy sources i.e. photovoltaic energy [1]. The thin films have strong phonon scattering interactions at the surfaces and lower thermal conductivity than those of bulk materials. The cost effective fabrication and ease of contact with redox electrolyte make thin films