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PII: S0169-4332(14)02505-7
DOI: http://dx.doi.org/doi:10.1016/j.apsusc.2014.11.040
Reference: APSUSC 29085

To appear in: *APSUSC*

Received date: 9-7-2014
Revised date: 7-11-2014
Accepted date: 8-11-2014

Please cite this article as: S. Žalenkienė, V. Krylova, J. Baltrusaitis, Deposition, structure and properties of polyamide-CdSe-CdS composite material using sorption-diffusion method, *Applied Surface Science* (2014), http://dx.doi.org/10.1016/j.apsusc.2014.11.040

Deposition, structure and properties of polyamide-CdSe-CdS composite material using sorption-diffusion method

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Highlights

- We investigated deposition of a single phase mixed CdSe-CdS on polyamide.
- A single precursor - $K_2SeS_2O_6$ – was used.
- XRD analysis showed hexagonal CdSe and orthorhombic CdS phases.
- Deposition mechanisms involved transient H_2SO_4 formation.

Abstract

Polyamide (PA) incorporated CdSe-CdS films were deposited using sorption-diffusion method. A single precursor - $K_2SeS_2O_6$ – was used as both sulfur and selenium source. In aqueous solution, $SeS_2O_6^{2-}$ diffused into the polymer where it reacted with Cd^{2+} ions to form cadmium chalcogenide particles. Crystallinity of the composite material was analyzed via XRD and both CdSe and CdS were detected within the material at all deposition conditions of temperature and $SeS_2O_6^{2-}$ - chalcogenization - exposure time. A complex surface speciation was obtained using XPS analysis. Formation of the protonated amide species was observed in combination with the adsorbed SO_4^{2-} on the surface of the polymer confirming that $SeS_2O_6^{2-}$ and its decomposition products hydrolyzed to form cadmium chalcogenides and H_2SO_4. A significant red shift in UV-Vis spectrum was observed with the increasing