

UV-VIS INVESTIGATION OF MIXED CADMIUM SULFIDE– CADMIUM TELLURIDE LAYERS ON POLYAMIDE 6 FORMED USING DIFFERENT WAYS OF PREPARING POLYAMIDE

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Cadmium sulfide (CdS), cadmium telluride (CdTe) and cadmium selenide (CdSe) are three of the II–VI compounds that have played a diverse role in investigating and seeking to use phenomena involving the interaction of light with semiconductors. In their pristine form, the electrodes normally exhibit low light-to-electricity conversion efficiency [1]. These compounds have been studied both as single crystal materials, and as thin-film materials [2]. CdTe is a material with a high absorption coefficient [3] and is mainly used in solar cells, finds application in IR detectors, radiation detectors, electrooptic modulators [4]. Cadmium sulfide has wide direct bandgap and high stability [5]. CdS is a semiconductor, which has a worldwide interest in photocatalytic applications [6].

Polyamide 6 films used in this study were obtained from Ensinger (Germany). PA 6 film was 500 µm thick with the density of 1.13 g/cm³. Prior to the experiments, PA film 15×70 mm in sizes were boiled in distilled water for 2 h (Sample 1). Other samples were stored in concentrated acetic acid at 20 °C for 0.5 h (Sample 2). Then they were dried using a filter paper and kept in a desiccator over anhydrous CaCl₂. The salts of potassium telluropentathionate (K₂TeS₄O₆·1.5H₂O), were prepared and chemically analyzed according to published procedure [7]. In the first stage, the PA 6 films were chalcogenized from 1.0 to 5 h at 20 °C, using a continually stirred acidified (0.2 mol·dm⁻³ HCl) 0.1 mol·dm⁻³ solution of K₂TeS₄O₆. In the second stage, the samples of chalcogenized PA were treated with the 0.1 mol·dm⁻³ solution of cadmium acetate, (Cd(CH₃COO)₂·2H₂O), for 10 min at the temperature 80 °C.

UV-VIS spectra were recorded on a Spectronic^R GenesysTM 8 UV/VIS spectrophotometer with compensation of the absorption of PA 6, the range of 200–800 nm.

UV-VIS absorption spectral analysis of the chalcogenated PA 6 films showed that the absorbance of polyamide 6, sample 1 was significantly lower than PA 6 sample 2, which absorbs and diffuses more telluropentathionate, TeS₄O₆²⁻, ions into the films thus treated [8].

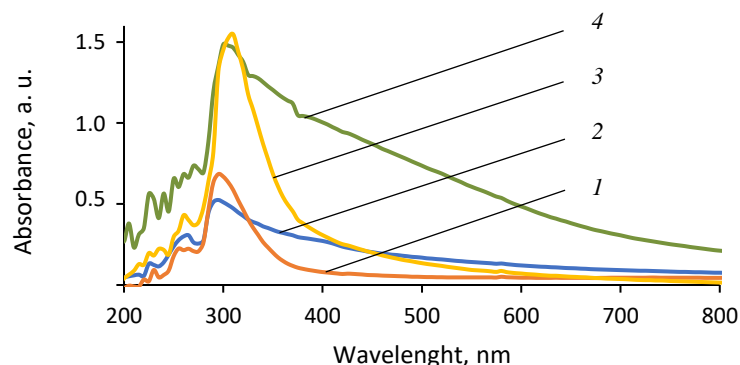


Fig.1. UV-VIS spektra of PA 6 film chalcogenized in K₂TeS₄O₆ solution for 5 h at 20 °C, and then treated in Cd(CH₃COO)₂·2H₂O solution: 1, 2 – sample 1; 3, 4 – sample 2

After interaction of the chalcogenated PA 6 with cadmium ions, peaks at 220, 245 and 260 nm are observed in the UV–VIS spectra. The absorption maximum at 295–310 nm is slightly lower in intensity and significantly wider (Fig. 1). Sample 1 after interaction with Cd(CH₃COO)₂·2H₂O, reached peak intensities at 0.275–0.593 nm. Otherwise sample 2 – has more intense peaks – from 0.767 to 1.668 nm. These changes in absorption are thought to indicate the formation of cadmium sulfide-cadmium telluride following the interaction of chalcogenated PA with cadmium ions.

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