Semiconductor film CuBi2O4, modified Pt

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Various methods for modifying the surface of semiconductors with platinum nanoparticles are presented in the literature: electrochemical and photoelectrochemical deposition, electrophoretic deposition, photoreduction, chemical deposition, vacuum deposition, atomic layer deposition. At the same time, chemical deposition of Pt, which does not require expensive vacuum and electrochemical equipment, seems to be the least energy-intensive and labor-intensive method. This method consists in applying a solution of H_2PtCl_6 to the surface of a semiconductor film and subsequent thermal thermal decomposition of this compound to platinum metal at temperatures above 400°C.

The chemical deposition method of platinum nanoparticles on the surface of semiconductor $CuBi_2O_4$ electrodes by dip-coating from an aqueous solution of 5 mmol/L H_2PtCl_6 followed by annealing at 450°C is shown. The platinum content in the modified $CuBi_2O_4$ film was determined by scanning electron microscopy. It was found that during dip-coating of platinum, the obtained Pt nanoparticles are globules 50–200 nm in size. The deposition of Pt on the surface of $CuBi_2O_4$ electrodes leads to an increase in the photocurrent density by 20% (0.3M NaOH solution). Modification of $CuBi_2O_4$ electrodes with Pt nanoparticles leads to a decrease in the degradation of the photocurrent from 25% to 3% after 300 s of photopolarization measurements.

High values of the quantum efficiency of the photocurrent, reaching 70%, and photoelectrochemical stability make it possible to consider $CuBi_2O_4$ electrodes modified with Pt nanoparticles as a promising system for use in photoelectrochemical solar cells and photoelectrochemical decomposition of water.

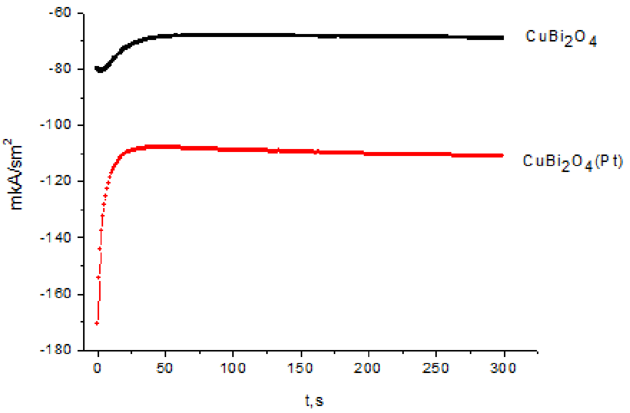

Figure 1 – Dependences of the photocurrent density on time

Acknowledgement
This research was supported by the MES RK, project AP 05130392