Correlation of the nanostructure of biopolymers intended for the detection of trace water pollutants with the amperometric properties of biosensors

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The biopolymer matrices were synthesized from epoxidized linseed oil (ELO), acrylated epoxidized soybean oil (AESO), trimethylolpropane triglycidyl ether (RD1), vanillin dimethacrylate (VDM), triarylsulfonium hexafluorophosphate salts (PI), and 2,2-dimethoxy-2-phenylacetophenone (DMPA). Linseed oil-based (ELO/PI, ELO/10RD1/PI) and soybean oil-based (AESO/VDM, AESO/VDM/DMPA) were examined using Positron Annihilation Lifetime Spectroscopy (PALS) and amperometry technique. The results of PALS based on the ortho-positronium (*o*-Ps) lifetime τ_3 and intensity I_3 as a function of temperature (120-320 K) and water sorption/desorption process in the samples of both systems are analyzed and discussed. The polymers were used as laccase immobilization matrices for construction of amperometric biosensors. A direct dependence of the main operational parameters of the biosensors and microscopical characteristics of polymer matrices (mostly on size of free volumes and water content) was established. These findings will allow better predictions for novel polymers as immobilization matrices for biosensing or biotechnology applications [1-4].

The next stage of the research is nanostructure investigation of soybean oil-based samples. The second group of investigated samples contains epoxidized soybean oil (AESO), vanillin dimethacrylate (VDM) and vanillin diacrylate (VDA) and triarylsulfonium hexafluorophosphate salts (PI). The samples contained different molar ratios of the tested substances. The PALS parameters were examined. The measurements of lifetime spectra were performed in the temperature range 120-320 K. The results obtained are focused on the analysis of τ_3 and I_3 as a function of temperature. The aim of the research is to find correlation between nanostructure and detection properties of the polymer matrices. This is necessary to find the best material to construct biosensors to detect xenobiotics pollution in water [1,3,4].

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