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Summary of the dissertation entitled

„**A new generation of electrodes as a tool in voltammetric determination of the biologically active compounds**”

The topic of my Ph.D. dissertation focuses on the application of a new generation of solid electrodes, such as a renewable silver amalgam film electrode and a boron–doped diamond electrode in the voltammetric analysis of selected biologically active compounds.

The current trend in the development and the investigation of new electrode materials led to the development of an environmentally friendly electrodes, according to the idea of "green analytical chemistry", which exhibit good electrochemical properties. Due to that fact it would be possible to apply them in the determination of organic compounds using sensitive electrochemical methods. Particularly interesting for me group of biologically active compounds are pesticides, which are widely used in the world in the agricultural and chemical industries. Noteworthy also are the drugs, which are used in the pharmaceutical industry.

The results of my work relied on the use of a new generation of solid electrodes in the electrochemical analysis of selected biologically active compounds and they are contained in a series of publications conclude in the present dissertation. With respect to the implementation of topic and its objectives, a series of targeted research leading to the development of voltammetric procedures for the determination of biologically active organic compounds using silver amalgam film electrode (nitenpyram, thiacloprid, clothianidin, cyazofamid, fenoxanil and fludioxonil) and boron–doped diamond electrode (fenfuram, paroxetine) were pefromed. Sensitive and rapid voltammetric techniques, such as square wave voltammetry (SWV) and square wave adsorptive stripping voltammetry (SWAdSV), were performed for each investigated compound. The optimization of the conditions and parameters were made for each compound. Thereafter, the analytical procedures for the determinations od each compound were developed, and the validations of the methods were carried out. The correctness of the proposed procedures were verified by the determination of each biologically active compound in a various spiked environmental samples (natural waters), in agricultural products (corn, rice, potato, triticale), as well as in the

commercial formulations (Calypso® 480–SC, PONCHO 600 FS, RANMAN Top) and in the pharmaceutical formulation (Nokturn®) by the standard addition method. Additionally, in order to explain the nature of the process taking place at the working electrodes, a detailed study were performed using cyclic voltammetry technique.

Additionally, in order to clarify the electrode mechanism of selected pesticides, the adsorption studies were conducted. Moreover, the influence of pesticides on the corrosion properties of stainless steel used to produce agricultural tools were investigated using electrochemical techniques (the measurement of corrosion potential in an open circuit, the measurement of polarization resistance according to Stern–Geary's method, the measurement of the impedance characteristic at corrosion potential, the measurement of the potentiodynamic characteristic towards the anodic direction). After corrosion tests, the surfaces of samples were examined using an optical microscope for characterization of corrosion damage. Furthermore, the mass spectrometry with electrospray ionization (ESI–MS) technique was applied to confirm the proposed electroreduction or electrooxidation mechanisms of selected pesticides. The morphology characterization of bare boron–doped diamond electrode was performed using AFM microscope.