

**„Pozyt w nanoobjętościach polimerów”-Streszczenie w języku angielskim/
„Positronium in polymers nanovolumes”-Summary in English:**

This doctoral dissertation concerns the study of biopolymers using the Positron Annihilation Lifetime Spectroscopy intended for the construction of biosensors detecting trace contamination of water with xenobiotics. The samples were tested for their applicability as matrices in the construction of biosensors. The results were correlated with electrochemical measurements. The first chapter of the work is an introduction to the research issues undertaken in this thesis. The second chapter concerns the properties of positrons and their annihilation. The third chapter describes the properties of the positium atom, its annihilation models in various media, and the Tao-Eldrup model used in this work to determine the size of free nanovolumes in the tested samples. The same chapter discusses radioactive sources that emit positrons. Chapter four describes the experimental techniques used to study the annihilation phenomenon. Analog and digital PALS spectrometers were discussed, with the differences between both types of devices indicated. This chapter also includes the design of the graphical interface of the PALS digital spectrometer and a discussion of spectra analysis. The fifth chapter is a theoretical introduction to the electrochemical techniques used in this work - cyclic voltammetry and chronoamperometry, used to determine the detection parameters of bioelectrodes constructed using the tested samples. The sixth chapter is an introduction to issues related to biosensors, their definition and applications. The issues of biosensor construction were discussed, with a detailed discussion of enzymatic biosensors with amperometric detection, which are tested as part of this work. The seventh chapter contains a description of the laccase enzyme used as a bioreceptor in biosensors, with particular emphasis on the use of this enzyme in the purification of water reservoirs. The eighth chapter discusses the parameters of biosensors that were determined in this work. Chapter 9 discusses the definition of xenobiotics, their harmfulness and the sources xenobiotics pollution. Chapter 10 is a general discussion of polymers and their types, and also discusses the application of the PALS technique in polymer investigation. Chapter 11 discusses the research hypothesis put forward in this work and the purpose of the research. Chapter 12 contains a detailed description of the tested biopolymer matrices. Chapter 13 discusses sample preparation for PALS measurements and the methodology for preparing bioelectrodes, and describes the measurement systems used. Chapter 14 is a discussion of the obtained measurement results. Chapter 15 describes the conclusions drawn from the conducted research.

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