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ABSTRACT OF PhD THESIS

Study of Extraction and Immobilization Posibility of Polyphenolic Compounds from Spruce Wood Bark

The thesis concerns the extraction and immobilization posibility of the phenolic compounds from spruce wood bark and contain two parts with a total of 5 chpaters.

The first part, Chapter I, *Polyphenols - important biologically active compounds* present the newest information regarding to the classification of the phenolic compounds, chemical, biochemical and biological properties, the extraction and characterization of the phenolic compounds, electrosppinning method and possibile applications of the polyphenols in the immobilized forms.

In the second part, Chapter II entitled *Extraction of polyphenolic compounds from spruce wood bark* is presented the extraction of the phenolic compounds by using ultrasound and microwave assisted extraction allowing the optimization of the processes. In this context the main parameters that influence the extraction process were evaluated. Processing conditions have been optimized by mathematical modeling and statistical analysis. For chemical characterization of the extracts was using FTIR analysis and ^{31}P NMR Ramman.

The Chapter III, *Immobilization of phenolic compounds found in spruce wood barx extract by electrospinning using the support poli (2-hydroxyethyl methacrylate) (PHEMA). In vitro release study,* reports on the development of electrospun poly (2-hydroxyethyl methacrylate) (pHEMA) fibers loaded with synthetic and natural antioxidants in the form of selected types of polyphenols such as vanillic, gallic, syringic acids, catechin or natural spruce bark extract to investigate their release behavior in terms of antioxidant activities. Homogenous fiber morphologies were obtained at specified concentration ranges of pHEMA within the spinning solutions, exhibiting fiber

diameters in the range of 0.5±0.1 μm to 1.9±0.5 μm. The 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay, used to monitor antioxidant activity, showed that polyphenols had retained their activity after incorporation into the pHEMA nanofibers. Furthermore, it was demonstrated that the encapsulation of polyphenols in pHEMA nanofibers can delay to a high extent their degradation induced by environmental factors.

In the Chapter IV - *Obtaining of nanofibers catechin loaded PLGA to reduce in vitro oxidative stress induced by multi-walled carbon nanotubes (MWCNT),* PLGA nanofibers carrying different concentrations of catechin were developed by emulsion electrospinning procedures. Emulsion and spinning process parameters and their influences regarding fiber properties were studied. Likewise, the polymer degradation behaviour of the fibers as well as the release characteristic of catechin by the total immersion method in phosphate buffered saline as type of releasing medium was investigated. Finally the antioxidant effect of catechin released from fibers on the human alveolar epithelial cell line A549 was examined.

Finally Chapter V presents the general conclusions of this thesis. Ahese results depict electrostatic spinning procedures as an effective tool for encapsulation and controlled release of functional active substances, and allows for localized and sustained application in the fields of tissue engineering and wound healing.

This PhD thesis was supervised by Professor emeritus Valentin I. Popa, Corresponding member of Academy of Technical Science of Romania. Some Experimental results were obtained in cooperation with scientist from EMPA-Switzerland in the program SCIEX of cooperation between Switzerland and Romania.

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