ACADEMIA ROMÂNĂ
SCOSAAR

HABILITATION THESIS

SUPRAMOLECULAR ARCHITECTURES GENERATED BY AZOMEHINE LINKAGE

***Fundamental area*: CHEMISTRY**

***Habilitation field*: CHEMISTRY**

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Abstract

The Habilitation Thesis entitled „Supramolecular Architectures Generated by Azomethine Linkage" continues and expands the research activity of the candidate after defending the PhD thesis „*Synthesis and study of some new compounds with liquid crystal properties*", at Institute of Macromolecular Chemistry, Iasi, on 12 April 2007, and confirmed by Ministry of Education and Research on the basis of Order no. 2398 dated 15.10.2007. In the framework of the PhD thesis were explored new thermotropic compounds, low molecular weight and polymers, especially designed to connect building blocks by azomethine linkage. This PhD topic was expanded to novel thematic directions, following the contact with other scientific fields approached during the research stages abroad.

Thus, following the research stage at Instituto per lo Studio delle Macromolecole, Milano, Italia, in the framework of the project ***EUROFET*** „**Organized molecular films and their use for organic field effect transistors and related opto-electronic devices**" on the topic of synthesis of new compounds with extended conjugation addressed to electronic and opto-electronic applications, I extended the study of liquid crystals to the exploiting thermotropic behavior in manufacturing materials for these applications. This new thematic direction materialized in synthesis of new thermotropic azomethine compounds containing luminescent mesogen, based on well known or less studied chromophoric groups. The compounds proved multifunctional properties which allowed their processing as thin continuous organized films with luminescent or semiconducting properties. It was demonstrated that the liquid crystalline supramolecular ordering represents a pathway in improving the emission and semiconducting properties.

Another milestone in my professional development was constituted by the postdoctoral fellowship „*Biopolymers based on chitosan and vanillin derivatives*", in the framework of the project ***„European Social Fund – CRISTOFOR I. SIMIONESCU – Postdoctoral Fellowship Programme"***. This project allows the translating of the knowledge accumulated in the domains of azomethines/ polyazomethines and supramolecular ordering to the field of the biopolymers based on chitosan, starting from the idea that chitosan is in fact a polyamine. The research stage at the Institut Européen des Membranes, Montpellier, France, „Adaptative Supramolecular Nanosystems" department, under the leadership of Prof. Dr. Mihai Barboiu, directed my research activities toward exploiting the reversibility of imine linkage forming in order to obtain supramolecular architectures. Thus, films and hydrogels based on chitosan were obtained, with tunable self-assembling at nano- and micro- level,

results never reported in literature. Important is the fact that the prepared biomaterials have dynamic character, responding to the environment stimulus.

The habilitation thesis presents three main thematic directions approached after PhD thesis defence.

In the **Chapter I** is presented the professional carrier evolution, from the point of view of scientific and academic achievements, as well as the concrete results, underlying their impact at national and international level.

The **Chapter II** is divided in three subchapters. The ***Subchapter II.1*** focuses mainly on the synthesis, thermotropic behaviour and luminescent properties of some new liquid crystalline compounds, low molecular weight and polymers, with a special attention to the possibility of preparing ordered, continuous films with luminescent and semiconducting properties. A collateral study was dedicated to a model for polydisperse liquid crystalline polymers, which shed light with regard to their thermotropic behavior.

The ***subchapter II.2*** is dedicated to the preparing of hybrid materials based on liquid crystals, obtained by (i) encapsulation of liquid crystals in different matrix polymers to give PDLC composite systems; (ii) dispersing low molecular weight luminescent liquid crystals in matrix polymers to give organic-organic luminescent hybrid materials; (iii) impregnating liquid crystalline polymers into a nanostructured inorganic matrix to give organic-inorganic luminescent hybrid materials. An important attention of the study goes to the understanding of interface phenomena and their influence on the material properties.

The ***subchapter II.3*** presents in a brief manner, the achievements reached in the field of biodynamic materials based on chitosan and the influence of imine forming reversibility on their supramolecular architecturing.

At the end of each subchapter are mentioned the scientific papers related to it.

The **Chapter III** shortly describes the scientific themes which will be developed in the future, and justify the desire to train PhD students.

The Habilitation Thesis ends with references which underline the scientific background of the personal researches, and also the own papers.