

Project title:

RESEARCHES IN THE FIELD OF POLYMERIC MATRICES DESIGN FOR SENSITIVE STRUCTURES

IDEAS Program **PN-II-ID-PCE-2008-2**

Contractor:

"Petru Poni" Institute of Macromolecular Chemistry Iasi Romania

Project ID_995; Contract no. 466/22.01.2009

Running period : 2009 - 2011

Total budget (initial approved): 1.000.000 RON

Total budget: 580042.2 700 RON

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Abstract

- The project envisages the development of the field to prepare new responsive structures. research aims to assure the scientific support needed by technological progress and starts from design of macromolecular compounds and moves towards to prepare of polymer matrices for sensitive structures and nanostructured architectures having responsive properties to be investigated and utilized as active and efficient elements in varied domains that address applications of these products.
- The proposed studies assure obtainment of polymer surfaces and their utilization in responsive structures, polymer matrices facilitate an easier coupling of sensitive structures, possibility of introduction of new functional groups with the coupling capacity improvement, a good stability, and stronger responsive behavior in response to stimuli by multiplication of the effects.
- As novelty elements we mention:
 - new polymeric structures realization, mainly biodegradable, for coupling sensitive compounds and obtaining of new intelligent materials: macromolecular matrix/sensor
 - amphiphil structures realization to improve coupling capacity
 - utilization of fluorescent compounds with multiple functions as sensing component
- Structural characterization of the polymeric matrices, investigation of structure and morphology of the hybrid surfaces polymer/sensor, getting thoroughly and extending the knowledge into the surface and interface of sensitive system, supramolecular evaluation of the prepared nanocomposites systems, establishing the critical concentrations and dimensions, respectively optimum ratio matrix/sensor, attempts to establish a mathematic model to correlate coupling conditions on sensing answer will enable elucidation of aspects regarding obtainment of new sensitive structures.

General objective:

The research intends to be a profound investigation theoretic and in the same time matter-of-fact for selecting and producing of materials proper for coupling sensing substances – challenge for any synthesizer – but also the improvement of the recognizing systems for instantly identification of a target component (pH, temperature, etc.) as well as of the mechanism from the sensor base.

- *The derived objectives are the following:*

Obtainment of new polymeric materials to use them as matrix enable for definitely coupling of the sensitive molecule responsible to have stabile and reproducible sensitive functions

Improvement of the coupling methods of the sensitive molecule by modifying the polymeric substrate

Applicative research activities oriented towards the obtainment, characterization and use of the fluorescent dye-dopped sensitive multifunctional nanocomposites materials

Functionality and supramolecular self-assembling correlation of the sensitive structure – polymeric matrix / sensitive molecule – in response to simultaneous multiple stimuli

Stage I/2009 – Dissemination of information

- Published papers:

1. L.E. Nita, A.P. Chiriac, I. Neamtu, M. Bercea, M. Pintilie; An analysis of the complexation between poly(aspartic acid) and poly(ethylene glycol); *COLLOIDS AND SURFACES A: PHYSICOCHEM. ENG.* 348 (2009) 254–262.
2. I. Neamtu, L. E. Nita, M. Bercea, A. P. Chiriac; The rheological behavior of chemically crosslinked hydrogels based on poly(acrylamide), *POLIMERY* 54 (11-12), (2009), 21-25.
3. L.E. Nita, A.P. Chiriac, S. Cimmino, C. Silvestre, D. Duraccio, C. Vasile; Polymerization in magnetic field. xx. Thermal behavior of the copolymers of styrene with 2, 3 epoxypropyl methacrylate synthesized in the magnetic field presence; *THE OPEN MACROMOLECULES JOURNAL*, 3, (2009), 27-36.
4. L.E. Nita, M. Pintilie, A.P. Chiriac; Upon a biomaterial structure; *BULETINUL INSTITUTULUI POLITEHNIC DIN IASI, TOMUL LV, FASC 3*, (2009), 101-108.
5. L. E. Nita, M. Pintilie, A. P. Chiriac; Tailoring a biomaterial structure based on poly (aspartic acid) and poly (ethylene glycol); *Materiale Plastice*, 46 (4), 2009, 345-349
6. O. Yilmaz, A. P. Chiriac, C. N. Cheaburu, L. E. Nita, G. Gulumser, D. Duraccio, S. Cimmino, C. Vasile; Nanocomposites based on montmorillonite/acrylic copolymer for aqueous coating of soft surfaces; *Solid State Phenomena*, 151, 2009, 129-134
7. Study of a binary interpenetrated polymeric complex by correlation of rheological parameters with zeta potential and conductivity; L. E. Nita, A. P. Chiriac , I. Neamtu, M. Bercea; *Colloids and surfaces B: Biointerfaces aparuta in nr. 76* (2010) 70–75