

Scientific report 2022

(A) Stage 1: The design and preparation optimization of the new polysulfone-POSS membranes (Months 1-12). Approach: Fabricate new polysulfone-POSS membranes and characterize its mechanical, surface properties and CO₂ permeability

Based on the promising results of preliminary work, we will consider the design and optimization of new polysulfone-POSS membranes using the fabrication parameters/techniques which have been identified as the most important in the preliminary experiments for obtaining the desired properties.

The following research objectives are proposed:

A.1.1. Fabrication of the new polysulfone-POSS membranes (Months 1-12): The deliverables for this activity are the following. We will fabricate ≥ 5 polysulfone-POSS membranes.

A.1.2. The characterization of the new polysulfone-POSS membranes (Months 2-12): The PS polymers will be characterized with gel permeation chromatography (GPC), nuclear magnetic resonance (NMR) and FTIR techniques, and the samples of silsesquioxanes will be characterized in terms of SEM morphology, FTIR spectroscopy and the datasheets of the materials will represent the deliverables of this activity.

A.1.3. The preparation optimization using neural networks (Months 3-12): The deliverables for this activity are the following. The parameters of the preparation process will be optimized in order to obtain samples with mechanical and CO₂ separation properties that are appropriate for integration with the given purpose.

A.1.4. Dissemination of results and intellectual property rights

The project will generate knowledge, technology and product with potential applicability. Fundamental research results will be published. It is expected to be published four papers in ISI indexed journals, relevant to the stages to be accomplished, with two papers in open access journal. The results will be disseminating through participation and presentation at seven conferences. Moreover, the results with potential further applicability will be included in one patent application.

- 1 ISI papers, 3 conference presentations; - 5 types of polysulfone-POSS membranes

A.1.5. Scientific Management. The project director is responsible for scientific management by monitoring compliance of the project work plan and working protocols established, periodic evaluation of the results obtained, adjust working strategies if necessary, dissemination of research results by publishing at least the number of scientific articles, performance of the steps for obtaining intellectual property.

A.1.6. Legal and economic-financial management. Financial management will consist of: following the compliance of the project financial plan for the activities planned and its revision if necessary; accounting of all financial activities related to the project (purchases, salaries, travel); developing the project financial report, financial audit of the project. The jurist will permanently monitor the compliance of legislation in all activities related to project implementation, will draw up employment contracts or amendments to contracts of employment for persons employed on the project.

All activities proposed to be carried out in Stage I of the AI-Syn-PPOSS project were fully carried out.

The results obtained through the implementation of the AI-Syn-PPOSS project during the first stage of development were disseminated at international scientific events, in the form of oral and poster communications, as well as in the form of two published articles, one article send it and a proceeding paper.

1. Daniela Filip, Doina Macocinschi, Mirela-Fernanda Zaltariov, Bianca-Iulia Ciubotaru, Alexandra Bargan, Cristian-Dragos Varganici, Ana-Lavinia Vasiliu, Dragos Peptănariu, Mihaela Bălan-Porcărașu, Mihaela-Mădălina Timofte-Zorilă, “Hydroxypropyl Cellulose/Pluronic-Based Composite Hydrogels as Biodegradable Mucoadhesive Scaffolds for Tissue Engineering”, *Gels* 2022, 8(8), 519, <https://doi.org/10.3390/gels8080519> (open access), (FI2021=4.432)(Q1)
2. George-Theodor Știubianu, Adrian Bele, Alexandra Bargan, Otilia Potolincă, Mihai Asăndulesa, Codrin Țugui, Vasile Tiron, Corneliu Hamciuc, Mihaela Dascălu, Maria Cazacu, “All-Polymer Piezo-Composites for Scalable Energy Harvesting and Sensing Devices”, *Molecules*, <https://doi.org/10.3390/molecules27238524> (open access), (FI2021 = 4.927) (Q2)
3. Adina Maria Doboș, Adriana Popa, Cristina Mihaela Rîmbu, Anca Filimon, “Influence of triethylphosphonium pendant groups on the structural and rheological properties of new quaternized polysulfones”, *Polymers*, sent for publication (open access), (FI2021 = 4.967) (Q1)
4. Irina Grădinaru, Bianca-Iulia Ciubotaru, Mihaela Dascălu, Alexandra Bargan, Ana-Lavinia Vasiliu, “Alginate dental impression materials with Allantoin enrichment: a morphology, dynamic vapor sorption and swelling evaluation” *Proceedings of The 10th IEEE International Conference on E-Health and Bioengineering - EHB 2022*, Grigore T. Popa University of Medicine and Pharmacy, Iași, România, November 17-18, 2022.

Conferences (posters and communications)

1. 6th International Conference on Chemical Engineering (ICCE 2022) scheduled from October 5-7 2022 în Iași, România. (S1-P34). Sorption capacity of silicone-based membranes with functionalized silsesquioxanes. Characterization and perspectives for environmental applications
Alexandra Bargan, George Știubianu, Mihaela Dascălu, Ana-Maria Macsim, Adrian Bele, Alina Soroceanu, <http://www.cercetare.icpm.tuiasi.ro/conferinte/ICCE2022/pdf/ICCE2022-program.pdf>
2. 28th International Symposium on Analytical and Environmental Problems, PROCEEDINGS OF THE 28th International Symposium on Analytical and Environmental Problems, Szeged, Hungary, November 14-15, 2022, (prezentare online) “Biological activity of silicone-based membranes with functionalized silsesquioxanes, characterization and perspectives for environmental applications”
Alexandra Bargan, George Știubianu, Mihaela Dascălu, Adrian Bele, Alina Soroceanu, Ana-Maria Macsim,
http://www2.sci.u-szeged.hu/isaep/index_htm_files/Proceedings_ISAEP_2022.pdf
3. The 10th IEEE International Conference on E-Health and Bioengineering - EHB 2022, Grigore T. Popa University of Medicine and Pharmacy, Iași, România, November 17-18, 2022, (comunicare online) Irina Grădinaru, Bianca-Iulia Ciubotaru, Mihaela Dascălu, Alexandra Bargan, Ana-Lavinia Vasiliu, “Alginate dental impression materials with Allantoin enrichment: a morphology, dynamic vapor sorption and swelling evaluation” *Proceedings of*
http://www.ehbconference.ro/Portals/0/EHB2022_Detailed_Program.pdf

The web page of the project was permanently updated during the development of the first stage of the project, all the results obtained being visible at the address: <https://icmpp.ro/aisynpposs/>