

Scientific report 2023

Stage 2: The preparation optimization of new polysulfone-POSS membranes with ionic liquids (Months 2-15). Approach:

A.2.1. The surface characterization and CO₂ adsorption and capture (Months 10-21): The deliverables for this activity are the following. We will fabricate ≥ 10 samples of membranes, such as the material from Stage 1. The total area of the samples will feature dimensions such as an area of ≥ 4 cm² and a thickness of ≤ 3 mm, with a datasheet for the products.

A.2.2. The preparation optimization of new polysulfone-POSS membranes with ionic liquids (Months 13-24): The PS-POSS-IL membranes will be characterized in terms of FTIR spectroscopy, mechanical properties, air and CO₂ permeability.

A.2.3. The properties optimization of the polysulfone-POSS membranes with different ionic liquids contents (Months 13-24): The parameters of preparation process and characterization of the membranes and the best neural network model choose for the principal objective of the project.

A.2.5. 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.

Expected results:

- 2 ISI papers, 3 conference presentations; 5 types of polysulfone-POSS containing ionic liquids membranes

A.2.6. 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.2.7. 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 (in case of deviations from the initial plan); 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 second stage of development were disseminated at international scientific events, in the form of oral and poster communications, as well as in the form of four published articles, one article accepted for publication.

1. A.M. Dobos, A. Popa, C.M. Rimbu, A. Filimon, „Structure-Bioactivity Relationship of the Functionalized Polysulfone with Triethylphosphonium Pendant Groups: Perspective for Biomedical Applications”, *Polymers*, 15(4), 877, (2023), <https://doi.org/10.3390/polym15040877> (open access), (FI₂₀₂₁ = 4.967) (Q1)

2. C. Cojocaru, P. Pascariu, A.C. Enache, A. Bargan, P. Samoila, „Application of Surface-modified nanoclay in a hybrid adsorption-ultrafiltration process for enhanced nitrite ions removal: Chemometric

approach vs. Machine Learning”, *Nanomaterials* 13(4), 697, (2023), <https://doi.org/10.3390/nano13040697> , (open access), F.I.=5.076, SRI= 1.687, (Q1).

3. D. Serbezeanu, M.M. Iftime, G.L. Ailiesei, A.M. Ipate, A. Bargan, T. Vlad-Bubulac, C.M. Rîmbu, „Evaluation of Poly (vinyl alcohol)–Xanthan Gum Hydrogels Loaded with Neomycin Sulfate as Systems for Drug Delivery”, *Gels* 9(8), 655, (2023), <https://doi.org/10.3390/gels9080655> , (open access), (FI₂₀₂₃=4.432) (Q1).

4. D. Filip, D. Macocinschi, S.L. Nica, M. Asandulesa, B. Condurache, E. Stoleru, D.M. Rata, A. Bargan, M.F. Zaltariov, „Hybrid green bionanocomposites based on chitosan/starch/gelatin and metallic nanoparticles for biological applications”, *International Journal of Biological Macromolecules* 253 (8), 127571, (2023), <https://doi.org/10.1016/j.ijbiomac.2023.127571> , (FI₂₀₂₃=8.2) (Q1).

5. B.I. Ciubotaru, M.F. Zaltariov, M. Dascalu, A. Bele, A. Bargan, M. Cazacu, “Amino-functionalized silicones processed as porous dual covalent/supramolecular networks for pressure sensing”, *Reactive and Functional Polymers* 194, 105792, acceptata spre publicare 21.11.2023, <https://doi.org/10.1016/j.reactfunctpolym.2023.105792>, (2023), (FI₂₀₂₂ = 5.1) (Q1).

Conferences (posters and communications)

1. Conferință științifică internațională „Patrimoniul de ieri – implicații în dezvoltarea societății durabile de mâine” (ediția a VII-a), Iași-Chișinău-Lviv, 9-10 februarie 2023, “Polysulfone-based membranes with functionalized silsesquioxanes. Characterization and perspectives for environmental applications”, Alexandra Bargan, George Știubianu, Mihaela Dascălu, Ana-Maria Macsim, Adrian Bele, Alina Soroceanu

https://ibn.idsi.md/sites/default/files/imag_file/Program_tezele_comunicarilor_conferinta_femeile_in_cercetare_2023_site.pdf

2. INVENTICA 2023, Inventics International Conference, The 27th edition 21-23.06.2023, Iași, România, (prezentare) “Intelligent tools for design, processing and optimization of new PS-POSS-IL (polysulfone-silsesquioxanes impregnated with ionic liquids) type membranes applied in CO₂ gas separation”; (poster –gold medal), Alexandra Bargan, Mihaela Dascalu, George Stiubianu, Adrian Bele, Cornel Cojocar, Anca Filimon, Adina Maria Dobos, Alina Soroceanu, Ana-Maria Macsim, Maria Cazacu, <https://ini.tuiasi.ro/conference/>



3. 12th International Conference on Environmental Engineering and Management, 13-16 September 2023, Iasi, Romania, PO 5.4. “The development and characterization of new membranes based on polysulfone and silsesquioxanes with perspectives in environmental applications”, Ciubotaru Bianca-Iulia, Alexandra Bargan, George Știubianu, Mihaela Dascălu, Ana-Maria Macsim, Adrian Bele, Alina Soroceanu, https://www.iceem.tuiasi.ro/wp-content/uploads/ICEEM12_Program-04.09.2023_f.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/aisynposs/>