Dr. Maria Cazacu

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Nationality: Romanian
Date/place of birth: January 26, 1956 in Tiganasi - Iasi, Romania

Education:

Ph.D. (April 1996), **Romanian Academy**, "Petru Poni" Institute of Macromolecular Chemistry, Iasi, Romania; Thesis: Synthesis of the siloxane polymers and copolymers by heterogeneous catalysis;

B.S. (July 1981), **"Gh. Asachi", Polytechnic Institute of Iasi, Romania** Faculty of Industrial Chemistry**,** Macromolecular Compounds Technology.

Professional Experience:"Petru Poni" Institute of Macromolecular Chemistry, Inorganic Polymers Department, Iasi, Romania (1989-present)

•Senior Researcher, Team Leader, (1997-present), PhD superviser since 2010;

•Researcher (1990-1997); •Engineer (1989-1990);

"FIRMELBO" Yarn Spinning - Botosani, Romania (1981-1989)

•Trainee Engineer (1981-1983);

•Work Team Leader (1981-1982);

•Technical Quality Control Technologist (1982-1989).

Current Position: Senior researcher (CSI), Head of Department of Inorganic Polymers, "Petru Poni" Institute of Macromolecular Chemistry, Iasi, PhD supervisor (nine doctoral theses supervised: seven theses completed and three in preparation; two other theses were co-supervised).

Publications: 271 scientific articles (127 as corresponding author) in ISI journal, an author book, two editor books and 11 book chapters, eight patents granted (one international) and six patent applications.

Scientometric indicators: 3328 citations (2392 without self-citations), h-index=27 (*Web of Science); 3645 citations, h-index=29 (ResearchGate); 4109* citations, h-index=32, i10-index=139 (Since 2019: 1842 citations, h-index 21, i10-index=61) (Google Scholar). 52 articles published in ISI journals in the last five years (13Q1, 26Q2).

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https://scholar.google.ro/citations?user=ZHTQTPEAAAAJ&hl=ro

Awards, membership of professional organizations:

●The Romanian Academy Prize for Chemistry, "C. D. Nenitescu" (1996);

●Diplomas and Gold Medals at: International Exhibition of Inventions Scientific Research and New Technologies, Inventika, 13th edition (2009), Bucuresti, Romania for the Patent "Polymer-based microactuator" and 22nd edition -2018 Iasi, Romania; at National Exhibition/Salon CHIMINVENT (2005 and 2013) Iasi, Romania;

●"Petru Poni" Medal and the Diploma of Honor for outstanding contributions to the promotion of chemistry awarded by the Romanian Chemistry Society (2019);

●"Cristofor Simionescu" Medal for Excellence in the Field of Macromolecular Chemistry, awarded by the American Chemical Society (October 2022);

●Nomination with the coordinated team in the "Best experienced research team" category at the first edition of the Romanian Researcher Gala (January 2023);

●Member of the Romanian Chemical Society since 2000;

●Corresponding member of the Romanian Academy since 2023.

Areas of interest:

●Monomers, polymers and silicone materials: optimization of methods for their controlled production and use as such or as platforms for the development, through appropriate chemical modification and processing, of new compounds and materials with specific characteristics, of interest for target applications, from medicine to some high-performance ones;

●Polymers and organic-inorganic materials self-repairing, recyclable and able to respond to different stimuli (electrical, mechanical, optical, thermal, environmental polarity, pH);

●Synthesis of proligands on amorphous silicon substrate and assembly of highly ordered coordination structures with dimensionality, from 0 to 3D, with different metals; identifying the particularities induced by the presence of the silicone motif in such compounds and their exploitation;

●Interdisciplinary collaborations, including polymer chemistry and physics, medicine, electrochemistry, catalysis, magnetism, environmental protection, biology, electronics, construction, energy, etc., to identify the potential use of silicone compounds and derived materials.

Professional skills

●Synthesis of silicon heterocycles and their chemical manipulation to obtain compounds and derived materials;

●Synthesis of siloxane oligomers, polymers and copolymers through various procedures;

●Polymerization techniques: ionic, radicalic, ring-opening polymerization, polycoordination, polycondensation, sol-gel;

●Chemical modification and processing of the silicone polymers as rubbers, oils, adhesives;

●Design and preparation of polymer materials for target applications (for example: energy, dentistry, prosthetics, construction, textiles, electronics, etc.);

●Preparation of organic-inorganic copolymers; segmented and graft copolymers having various internal functions (ester, ether, amide, imide, anhydride, azomethine, azo) able to develop biphasic morphology, photochemical, surface, liquid crystalline, controlled degradability properties;

●Preparation of organic/inorganic hybrid materials (composites, networks, hybrids);
●Synthesis of proligands with siloxane spacers or trimethylsilane "tails" and metal coordination structures with different dimensionalities (0D, 1D, 2D or 3D).
Language: Native Language: Romanian; Other languages: English.
Organisational skills and competences: •Project management: attracting funds for research through the application and implementation of projects; •Coordination of the scientific activities for a research team (5-15 members) in the period 1997-present; •Head of Department of Inorganic Polymers since 2015 (30-40 members).
Involvement in research projects: 45 projects:
•13 projects as project coordinator (between them a project financed by European Regional Development Fund), of which three in the last five years; •12 projects as partner team leader (between them a European FP7 project and a COST project - National leader, member in management committee for COST Action MP1003 European Scientific Network for Artificial Muscle, ESNAM), of which three in the last five years; •20 as member, of which three in the last five years; •Seven applicative research projects (team member).
The main research grants:
●Emerging 2D materials based on two-dimensional permethylated metal-organic networks, 2D-PerMONSil, Exploratory Research Project PN-III-P4-ID-PCE-2020-2000/(207/2021, 2021-2023)/director project;
●Soft electromechanical transducers based on 3D printed silicones, 3DETSi, Experimental demonstration project, PN-III-P2-2.1-PED-2019-3652 (320PED/2020, 2020-2022)/director project;
●Metal-organic networks with finely controlled hydrophobicity using silicone chemistry, SiMOFs, Research project: PN-III-P4-ID-PCE-2016-0642 (114/2017/ 2017-2019)/director project;
●Silicone-based energy conversion units built up by green chemistry, Experimental demonstration project, GrEENergy, PN-III-P2-2.1-PED-2016-0188 (68PED / 2017, (2017-2018)/director project;
●New coordination networks containing polyfunctional flexible bridges, Exploratory Research Projects - PN-II-ID-PCE-2012-4, Contract 53/2.09.2013, 2013-2016/director project;;
●Collaborative project FP7-Energy-2012-1-2STAGE, New mechanisms and concepts for exploiting electroactive Polymers for Wave Energy Conversion, PolyWEC, GA 309139, 2012-2016/partner responsible;
●Coordination compounds of some 2d metals with Schiff bases containing siloxane or silane units, CoMetAR, PN-II-CT-RO-AT-2013 -1, Capacities Program, Subprogram "Bilateral cooperation - Bilateral cooperation program Romania – Austria, Contract no. 749/01.01.2014 (2014-2015)/project director;
●Coordination compounds of transition elements based on flexible polydentate ligands as biologically active agents and precursors for oxide materials, ComSilBio, PN-II-CT-RO-MD-

2012-1, Capacities, Bilateral Cooperation Subprogram - Bilateral Cooperation Program Romania - Republic of Moldova, Contract 690/16.04.2013 (2013-2014)/project director;

●Synthesis and study of the polymeric metallosiloxanes – new materials for catalysis and nanosciences (POLISILMET), SOP IEC-A2-O2.1.2-2009-2, ID 570/project manager;

●Multifunctional nanostructured silicone materials (NANOSIMAT), Contract CEEX-MATNANTECH 52/2006 (2006-2008).

●Multifunctional Spin Crossover Materials, SPINSWITCH, H2020-MSCA-RISE-2016, No 734322/team member, PhD superviser;

●Energy harvesting by dielectric elastomer generators, Romania-Switzerland Research Program (RSRP) The program from PNII in Romania: Ideas NO: 10/ RO-CH/RSRP/01.01.2013 (2013-2015)/team member;

●Strengthening the Romanian research capacity in Multifunctional Polymeric Materials, STREAM, FP7-REGPOT-2010-1, Specific Programme: Coordination and support action, Grant Agreement no: 264115 (2011-2014)/advisory board member;

●The financial support of European Social Fund – „Cristofor I. Simionescu" Postdoctoral Fellowship Programme, POSDRU/89/1.5/S/55216), Sectoral Operational Programme Human Resources Development 2007 – 2013 (2010-2013)/mentorship activity for postdoctoral fellows.

Other activities:

●Peer-review activity for national (UEFISCDI) and international (INTAS, ERA.NET RUS, National Science Centre - Poland, Czech Science Foundation) programs/projects;

●Peer-review activity for scientific journals: over 190 scientific articles reviewed;

●Member of the Examination Board for 21 doctoral theses and 5 habilitation thesis;

●Member of Promotion Commissions for higher positions (CSI, CSII, Professor): 3;

●Member of CNATDCU: 2016-2020; 2020-prezent, vice-president of the chemistry section;

●Member of CSUD-SCOSAAR since 2023.

Significant contributions

With 34 years of research experience, mainly in the field of silicones, I coordinate the **SmartSil team**, the continuation of the only research collective in the field of silicones in Romania. By identifying and understanding scientific and economic priorities, exploiting the accumulated knowledge portfolio, and establishing coherent research programs, I believe that I have contributed to defining a field with clear research directions and to consolidating a powerfull, visible team with a solid background in exploiting the chemistry and particularities of silicones to bring them to another level, as valuable, "smart" materials. For this, in addition to the core team of established researchers, I trained nine PhD students on topics in the field of silicones (seven theses completed and three in preparation), two other theses under co-supervision being on different fields.

Together with the team, I got involved in obtaining new compounds and derivative materials, stimuli-responsive for the needs of emerging and future technologies. For this, we have designed

valuable hybrid structures that synergistically combine the unique properties of silicones with those of other organic or inorganic compounds and, as far as possible, meet the requirements of sustainability. Thus, by manipulating the chemical structure, the crosslinking pattern or appropriate additions (metal oxides and complexes, ceramic materials, organic polymers as nanoparticles or networks), we have developed silicone elastomers that can be thermosetting or, more recently, thermo- and/or solvoplastic, functional as active elements (dielectric and flexible electrode) in electromechanical transducers (sensors, actuators or generators), piezoelectric, thermochromic or optical sensors (**45 articles published in ISI journals on this subject, 15 of which in the last five years**). By attaching suitable organic groups to the flexible and hydrophobic silicone substrates, we developed a series of original proligands based on which we built highly ordered compounds and coordination networks with metals. They present properties induced by the coexistence in the structure of polar-nonpolar, hydrophilic-hydrophobic, crystalline-amorphous fragments: self-assembly capacity, both in solid state and in solution, surface hydrophobicity in solid state, mesophase, glass transition at low temperatures, etc. (over 120 such structures registered so far in the CCDC database and over 90 articles published in ISI journals, of which **30 articles and 35 structures in the last five years**). The 2D coordination networks that form mainly on the basis of such surface-active ligands, due to the extremely weak interactions between the layers, have proven to be easily exfoliable into individual nanosheets, similar to graphene, the revolutionary carbon-based material or, more recently, the MXenes. Compared to these, the 2D coordination networks possess more parameters, through which the properties can be directed (the silicone fragment, the group and the coordination model, the metal ion, the co-ligand). I am the author/co-author of the first articles in the literature with such structures based on ligands with siloxane spacers or trimethylsilane "tails".

The results of the scientific activity can be found in 271 published in ISI journals (of which **52 in the last five years**) and more than 100 studies in other specialized national or international journal, or in the volumes of recognized scientific events from the country and abroad at which they were presented. I am the corresponding author for 127 ISI articles (47%), of which **24 in the last five years**. I have also published three books (one by author and two as editor) and 12 book chapters. I am co-author of 8 granted patents (of which **two in the last five years**) and 6 patent applications (including one international patent) and seven applied research papers at the laboratory level, developed within the program for the development of silicone technologies in Romania in the period 1989-1991.

Part of the developed research activities were financed from extra-budgetary funds, in a total equivalent amount of about EUR 3,900,000 attracted through 25 research projects, obtained by participating in national and international competitions, in which I had the capacity of project director (13, of which one project from Structural Funds POS CCE and two bilateral projects with abroad) or responsible partner (12, of which one European project from the FP7 program) but also through research services to third parties. Of these, EUR 925,000 were attracted through projects completed in the last five years (3 as project director and three as responsible partner). Also, I was involved as a member in the teams of 20 national and international projects (3 in the

last five years). Through the attracted funds, I equipped the laboratory with eight large pieces of equipment (three of them purchased in the last five years), the most important being the X-ray diffractometer on a single crystal (Oxford-Diffraction XCALIBUR E) which, under the conditions of attracting and permanentizing a high-level specialist in the institute, became a real "hub" of national and international collaboration, with 124 articles published in collaboration on crystallographic analysis only in the last five years. Also, the young human resource was formed to meet the growing demands and ensure continuity in crystallographic analysis. I ensured the material basis necessary for the development of creative ideas, mobility and salary motivation of team members, including doctoral students (equivalent to approximately EUR 176,000 for doctoral students in the period 2011-2023, from which about 56,000 EUR in the last five year). I believe that the results obtained reflect the constant commitment to innovation and progress in a field with a significant potential and impact for all areas of human activity, given that the human resource engaged in this endeavor is limited.

Significant publications

Articles have been selected to somewhat outline the evolution, from studies on amorphous silicone compounds and materials, and their transition from passive to some active, "smart" ones, to derivatives with a high ordering degree consisting mainly of coordination compounds and polymers.

Amorphous silicones

1. Cazacu, M., Marcu, M., Vlad, A., Caraiman, D., & Racles, C. (**1999**). *Synthesis of functional telechelic polydimethylsiloxanes by ion-exchangers catalysis. European Polymer Journal, 35(9), 1629–1635.* https://doi.org/10.1016/S0014-3057(98)00263-8, **IF 6.0, Q1, 38 citations WoS (48 on *Google Scholar*)**

2. Racles, C., Cazacu, M., Fischer, B., & Opris, D. M. (**2013**). *Synthesis and characterization of silicones containing cyanopropyl groups and their use in dielectric elastomer actuators. Smart Materials and Structures, 22(10), 104004.* doi:10.1088/0964-1726/22/10/104004, **IF 4.1, Q2, 58 citations WoS (79 on *Google Scholar*)**

3.Tugui, C., Tiron, V., Dascalu, M., Sacarescu, L., & Cazacu, M. (**2019**). *From ultra-high molecular weight polydimethylsiloxane to super-soft elastomer. European Polymer Journal, 109243.* doi:10.1016/j.eurpolymj.2019.10, **IF 6.0, Q1, 12 citations WoS (79 on *Google Scholar*)**

4.Bele, A., Cazacu, M., Stiubianu, G., Vlad, S., & Ignat, M. (**2015**). *Polydimethylsiloxane–barium titanate composites: Preparation and evaluation of the morphology, moisture, thermal, mechanical and dielectric behavior. Composites Part B: Engineering, 68, 237–245.* doi:10.1016/j.compositesb.2014, **IF 13.1, Q1, 39 citations WoS (51 on *Google Scholar*)**

5.Tugui, C., Vlad, S., Iacob, M., Varganici, C. D., Pricop, L., & Cazacu, M. (**2016**). *Interpenetrating poly(urethane-urea)–polydimethylsiloxane networks designed as active elements in electromechanical transducers. Polymer Chemistry, 7(15), 2709–2719.* doi:10.1039/c6py00157b, **IF 4.6, Q1, 40 citations WoS (55 on *Google Scholar*)**

6.Tugui, C., Serbulea, M.-S., & Cazacu, M. (**2019**). *Preparation and characterisation of stacked planar actuators. Chemical Engineering Journal.* doi:10.1016/j.cej.2019.01.15, **IF 15.1, Q1, 11 citations WoS (12 on *Google Scholar*)**

7.Tugui, C., Cazacu, M. Manoli, D.M., Stefan, A., Duduta, M. (**2023**). All-Silicone 3D printing technology: toward highly elastic dielectric elastomers and complex structures; *ACS Applied Polymer Materials* 5 (10), 7936-7946. DOI 10.1021/acsapm.3c01190. **IF 5.0, Q1, 1 citation WoS**

8. Cazacu, M., Dascalu, M., Stiubianu, G.T., Bele, A., Tugui, C., Racles C. (**2022**). *From passive to emerging smart silicones***,** *Rev. Chem. Eng.* https://doi.org/10.1515/revce-2021-0089. **IF 4.7, Q2, 4 citations WoS (7 on *Google Scholar*)**

Highly ordered silicones

9.Cazacu, M., Racles, C., Zaltariov, M.-F., Dascalu, M., Bele, A., Tugui, C., Bargan, A., Stiubianu, G. (**2021**). *From Amorphous Silicones to Si-Containing Highly Ordered Polymers: Some Romanian Contributions in the Field. Polymers, 13(10), 1605.* doi:10.3390/polym13101605, **IF 5.0, Q1, 5 citations WoS (7 on *Google Scholar*)**

10.Cazacu, M., Marcu, M., Vlad, A., Rusu, G. I., & Avadanei, M. (**2004**). *Chelate polymers. VI. New copolymers of the some siloxane containing bis(2,4-dihydroxybenzaldehyd-imine)Me2+ with bis(p-carboxyphenyl)diphenylsilane. Journal of Organometallic Chemistry, 689(19), 3005–3011.* https://doi.org/10.1016/j.jorganchem.2004.05.051, **IF 2.3, Q2, 62 citations WoS (81 on *Google Scholar*)**

11.Cazacu, M., Vlad, A., Marcu, M., Racles, C., Airinei, A., & Munteanu, G. (**2006**). *New Organometallic Polymers by Polycondensation of Ferrocene and Siloxane Derivatives. Macromolecules, 39(11), 3786–3793.* doi:10.1021/ma052030y, **IF 5.5, Q1, 42 citations WoS (49 on *Google Scholar*)**

12.Soroceanu, A., Cazacu, M., Shova, S., Turta, C., Kožíšek, J., Gall, M., Breza, M., Rapta, P., Mac Leod, TCO., Pombeiro, AJL., Telser, J., Dobrov, AA., Arion, V. B. (**2013**). *Copper(II) Complexes with Schiff Bases Containing a Disiloxane Unit: Synthesis, Structure, Bonding Features and Catalytic Activity for Aerobic Oxidation of Benzyl Alcohol. European Journal of Inorganic Chemistry, 2013(9), 1458–1474.* doi:10.1002/ejic.201201080, **IF 2.3, Q2, 58 citations WoS (55 on *Google Scholar*, 59 on journal site)**

13.Shova, S., Tiron, V., Vlad, A., Novitchi, G., Dumitrescu, D. G., Damoc, M., Zaltariov, M. F., Cazacu, M. (**2020**). *Permethylated dinuclear Mn(III) coordination nanostructure with stripe-ordered magnetic domains. Applied Organometallic Chemistry.* doi:10.1002/aoc.5957, **IF 3.9, Q1, 4 citations WoS (5 on *Google Scholar*)**

14.Zaltariov, M.-F., & Cazacu, M. (**2020**). *Coordination compounds with siloxane/silane-containing ligands capable of self-assembly at nano/micro scale in solid state and in solution. Advances in Inorganic Chemistry.* doi:10.1016/bs.adioch.2020.03, **IF 2.93, Q2, 3 citations WoS (5 on *Google Scholar*)**

15.Damoc, M., Tiron, V., Tugui, C., Varganici, C.D., Stoica, A.-C., Novitchi, G., Dascalu, M., Cazacu, M. (**2023**). Ferronematic Co(II) complex: an active filler for magnetically actuated soft materials, Small 2307006. **IF 13.3, Q1**

15.01.2024