# Tamaz Guliashvili (Ph.D.)

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Organic/Polymer Chemist with over 10+ years of proven and successful experience in silicon organic chemistry, physical organic chemistry, polymer chemistry, organic synthesis. Expertize in monomer, polymerization inhibitor/retarder synthesis, conventional and living radical polymerizations (ATRP, RAFT, NMP), suspension/emulsion polymerizations, preparation of functionalized porous polymer beads for blood filtration.

WORK EXPERIENCE:

11/2010 - Present:
Co-supervisor / Scientific consultant of several PhD candidates from Department of Chemical Engineering of Coimbra University, Portugal. Field of research: New methods development in Living Radical Polymerizations of vinyl monomers.

09/2013 – Present:
Senior Scientist II at Cytosorbents Inc. (Monmouth Junction, NJ)

*Key Responsibilities and Contributions:*

- ✓ Developed various functional porous polymer beads based on divinylbenzene crosslinker used in human blood purification devices (removal of cytokines, toxins, and K+ cation (hyperkalemia treayment) from human blood and physiological fluids).
- ✓ Developed chemical synthesis methods of selective surface functionalization of porous polymer beads.

01/2007 – 04/2013.
Lead Scientist at GENERAL ELECTRIC (Trevose, PA)

*Key Responsibilities and contributions:*

- ✓ Developed a novel acrylamide free (co)polymers used in waste water treatment application to address anticipated environmental regulations.
- ✓ Constant collaboration with Pilot Plant and Manufacturing sites to help with scale up, production of water based (co)polymers.
- ✓ Leading insourcing projects aiming the in-house manufacturing of water soluble (co)polymers > 2MM of cost reduction.
- ✓ Developed a new synthetic method for preparation of water soluble chloride anion free cationic monomers (Acrylates, Methacrylates and Allylic monomers containing quaternary ammonium groups) and their polymerization in aqueous media used for industrial water treatment applications > Patented technology for new market opportunities.
- ✓ Developed a novel eco-friendly polymeric coagulant based of graft copolymerization of chitosan with (Meth)Acrylate monomers for storm water remediation
- ✓ Designed, synthesized and tested novel small organic molecules used as Styrene Monomer radical polymerization inhibitors/retarders > Patented novel inhibitor superior to TEMPO and other inhibitors.

- ✓ Participated in scale up process of the developed products in Pilot Plant and Manufacturing sites.
- ✓ Close collaboration with analytical, applications, product management, and sourcing.

12/2004 – 12/2006.
Postdoctoral Research Scientist,
Department of Chemistry, University of Pennsylvania, Philadelphia, PA, USA

Key Contributions:

- ✓ Developed ambient temperature living radical polymerization of vinyl monomers (Single Electron Transfer Living Radical Polymerization: SET-LRP).
- ✓ Synthesis and characterization of variety of block, graft and star shaped polymers using SET-LRP method.
- ✓ Investigated mechanism of SET-LRP by using experimental and computational methods.

03/2001 – 11/2004
Research Assistant (PhD Candidate)
Department of Organic Chemistry, Uppsala University, Uppsala, Sweden
Key Contribution:

- ✓ Designed, synthesized, characterized Si=C double bonded compounds (silenes) with reversed Si=C bond polarization and studied their reactivity by experimental and theoretical methods.
- ✓ Discovered a novel base free protection of alcohols with silyl groups using carbamylsilanes.
- ✓ Synthesized first isolable metal 2-silenolate (silicon analogue of metal enolates) and studied its structure and reactions.

EDUCATION:

PhD in Organic Chemistry, (November, 2004)
Department of Organic Chemistry, Uppsala University, Uppsala, Sweden
Thesis title: "Synthesis and Reactivity Studies of Zwitterionic Silenes and 2-Silenolates"

SKILLS:

- Synthesis, purification and characterization of small molecules and polymers.
- Physical organic chemistry: Organic reaction mechanism investigation.
- Concept introduction to pilot scale up and commercialization of new products.
- Expertize in Acrylate monomer conventional and living radical polymerizations.
- Handling of air/moisture sensitive compounds.
- Hands on experience in modern polymerization techniques including controlled/"living" radical polymerizations (Atom Transfer Radical Polymerization (ATRP), Single Electron Transfer Living Radical Polymerization (SET-LRP), Nitroxide Mediated Polymerization (NMP), Reversible Addition Fragmentation Chain Transfer Polymerization (RAFT), Iodine Degenerative Chain Transfer Polymerization.
- Analytical: NMR, HPLC, GPC, UV-vis, etc.
- Hands on experience in Quantum-Chemical calculations/modeling of chemical reactions.
- ChemOffice, ISIS Draw, Scifinder Scholar, Beilstein Commander, Delphion, Microsoft Project, etc.
- Experienced in scientific/technical paper writing and peer reviewing.
- Experienced in patent writing and patent search.

**Citizenship:** United States of America and Republic of Georgia

**Patents:**

3. Tamaz Guliashvili, Ali Fadhel

Use of Aliphatic Nitroso Compounds as Inhibitors of Radical Polymerization of Activated Vinyl Monomers. Submitted to **USPTO 02/19/2013. Application N: PCT/US2013/026658**

**(GE Company)**

2. Tamaz Guliashvili, Stephen Vasconcellos.
"Methods of Preparing Novel Halide Anion Free Quaternary Ammonium Salt Monomers, Polymerization Methods Therefor, and Methods of Use the Resulting Polymers"
US 2012/0125863 A1. Pub Date: May, 24, **2012. (General Electric)**

1. Virgil Percec, Tamaz Guliashvili, Anatoliy V. Popov.
"Living Radical Polymerization of Acrylic Monomers and Formation of Block Copolymers Therefrom" US 7,470,762 B2. Pub. Date: Dec. 30, **2008. (University of Pennsylvania)**

**Peer Reviewed Publications:**

43. Pedro Maximiano†, Patrícia V. Mendonça†, João R. C. Costa†, Naomi L. Haworth‡, Arménio C. Serra†, Tamaz Guliashvili*†, Michelle L. Coote*‡, and Jorge F. J. Coelho*†
"Ambient Temperature Transition-Metal-Free Dissociative Electron Transfer Reversible Addition–Fragmentation Chain Transfer Polymerization (DET-RAFT) of Methacrylates, Acrylates, and Styrene" ***Macromolecules***, 2016, Article ASAP**. DOI: 10.1021/acs.macromol.5b02647**. Publication Date (Web): February 26, 2016.

42. Carlos M. R. Abreu†, Patrícia V. Mendonça†, Arménio C. Serra†, Benjamin B. Noble‡, Tamaz Guliashvili*§, Julien Nicolas*‖, Michelle L. Coote*‡, and Jorge F. J. Coelho*†
"Nitroxide-Mediated Polymerization of Vinyl Chloride at Low Temperature: Kinetic and Computational Studies" ***Macromolecules,*** 2016, *49* (2), 490-498.

41. JR Góis, AV Popov, T Guliashvili, AC Serra, JFJ Coelho
"Synthesis of functionalized poly (vinyl acetate) mediated by alkyne-terminated RAFT agents"
***RSC Advances*** 2015, *5*, 91225-91234

40. João R. C. Costa[†], Patrícia V. Mendonça[†], Pedro Maximiano[†], Arménio C. Serra[†], Tamaz Guliashvili[*§], and Jorge F. J. Coelho[*†]
"Ambient Temperature "Flash" SARA ATRP of Methyl Acrylate in Water/Ionic Liquid/Glycol Mixtures" ***Macromolecules,*** 2015, *48* (19), 6810–6815

39. Maximiano, P., Mendes, J. P., Mendonça, P. V., Abreu, C. M. R., Guliashvili, T., Serra, A. C. and Coelho, J. F. J.
"Cyclopentyl methyl ether: A new green co-solvent for supplemental activator and reducing agent atom transfer radical polymerization". ***J. Polym. Sci. A Polym. Chem***. 2015, *53*, 2722–2729.

38. Joana P Mendes, Fabio Branco, Carlos MR Abreu, Patricia V Mendonca, Arménio C Serra, Anatoliy V Popov, Tamaz Guliashvili, Jorge FJ Coelho
"Sulfolane: an Efficient and Universal Solvent for Copper-Mediated Atom Transfer Radical (co) Polymerization of Acrylates, Methacrylates, Styrene, and Vinyl Chloride." ***ACS Macro Letters***, 2014, 3 (9), 858-861

37. P.V. Mendonça, A.C. Serra, A.V. Popov, Tamaz Guliashvili, J.F.J. Coelho
"Efficient RAFT polymerization of N-(3-aminopropyl) methacrylamide hydrochloride using unprotected "clickable" chain transfer agents"***Reactive and Functional Polymers,*** 2014, 81, 1-7

36. Patrícia V Mendonça, Saadyah E Averick, Dominik Konkolewicz, Arménio C Serra, Anatoliy V Popov, Tamaz Guliashvili, Krzysztof Matyjaszewski, Jorge FJ Coelho
"Straightforward ARGET ATRP for the Synthesis of Primary Amine Polymethacrylate with Improved Chain-End Functionality under Mild Reaction Conditions."

***Macromolecules***., 2014, 47 (14), 4615-4621

35. Joana P Mendes, Fábio Branco, Carlos MR Abreu, Patrícia V Mendonça, Anatoliy V Popov, Tamaz Guliashvili, Arménio C Serra, Jorge FJ Coelho
"Synergistic Effect of 1-Butyl-3-methylimidazolium Hexafluorophosphate and DMSO in the SARA ATRP at Room Temperature Affording Very Fast Reactions and Polymers with Very Low Dispersity" ***ACS Macro Letters***., 2014, 3, 544-547

34. Patrícia V Mendonça, Dominik Konkolewicz, Saadyah E Averick, Arménio C Serra, Anatoliy V Popov, Tamaz Guliashvili, Krzysztof Matyjaszewski, Jorge FJ Coelho
"Synthesis of cationic poly ((3-acrylamidopropyl) trimethylammonium chloride) by SARA ATRP in ecofriendly solvent mixtures"
***Polym. Chem,***, 2014, 5 (19), 5829-5836

33. Joana R Góis, Nuno Rocha, Anatoliy V Popov, Tamaz Guliashvili, Krzysztof Matyjaszewski, Arménio C Serra, Jorge FJ Coelho
"Synthesis of well-defined functionalized poly (2-(diisopropylamino) ethyl methacrylate) using ATRP with sodium dithionite as a SARA agent"
***Polym .Chem***., 2014, 5 (12), 3919-3928

32. Michal Czyzewski, Jonathan D Sellars, Tamaz Guliashvili, Julius Tibbelin, Lisa Johnstone, Justin Bower, Matthew Box, Robert DM Davies, Henrik Ottosson, Patrick G Steel
"The first intramolecular silene Diels–Alder reactions"
***Chem. Commun.,*** 2014, 50 (22), 2919-2921

31. Rosemeyre A. Cordeiro, Nuno Rocha, Joana P. Mendes, Krzysztof Matyjaszewski, Tamaz Guliashvili, Arm´enio C. Serra and Jorge F. J. Coelho.
"Synthesis of well-defined poly(2-(dimethylamino)-ethyl methacrylate) under mild conditions and its co-polymers with cholesterol and PEG using Fe(0)/Cu(II) based SARA
ATRP"
***Polym. Chem.***, 2013, 4 (10), 3088-3097

30. Nuno Rocha, Patricia V. Mendonca, Joana P. Mendes, Anatoliy V. Popov, Tamaz Guliashvili, Armenio C. Serra and Jorge F.J. Coelho.
"Facile synthesis of well-defined telechelic alkyne-terminated polystyrene in polar media using ATRP with mixed Fe/Cu transition metal catalyst"
***Macromolecular Chemistry and Physics,*** 214 (1), 2013**,** 76-84

29 Ganna Gryn'ova, Tamaz Guliashvili, Krzysztof Matyjaszewski and Michelle L. Coote "Computational Evaluation of the Sulfonyl Radical as a Universal Leaving Group for RAFT Polymerisation" ***Aust. J. Chem.*** **2013**, *66*, 308-313.

28. Carlos M. R. Abreu, Patrícia V. Mendonça, Arménio C. Serra, Anatoliy V. Popov, Krzysztof Matyjaszewski, Tamaz Guliashvili, and Jorge F. J. Coelho

"Inorganic Sulfites: Efficient Reducing Agents and Supplemental Activators for Atom Transfer Radical Polymerization" ***ACS Macro Lett.,*** 2012**,** *1* (11),1308–1311

27. Tamaz Guliashvili, Patrícia V. Mendonça, Arménio C. Serra, Anatoliy V. Popov, and Jorge F.J. Coelho
"Copper Mediated Living Radical Polymerization in Polar Solvents: Insight into Some Relevant Mechanistic Aspects" ***Chem. Eur. J***. 2012, *18, (15),* 4607-4612.

26. Carlos Abreu, Patrícia Mendonça, Arménio Serra, Jorge Coelho, Anatoliy Popov, Ganna Gryn'ova, Michelle Coote, Tamaz Guliashvili
"Reversible addition-fragmentation chain transfer polymerization of vinyl chloride" ***Macromolecules*** 2012, *45*, 2200−2208.

25. Patrícia V. Mendonça, Arménio C. Serra, Jorge F.J. Coelho, Anatoliy V. Popov, and Tamaz Guliashvili

"Ambient Temperature Rapid ATRP of Methyl Acrylate, Methyl Methacrylate and Styrene in Polar Solvents with Mixed Transition Metal Catalyst System". ***European Polymer Journal*** **2011**, *47*, 1460.

24. Abdirisak A. Isse, Armando Gennaro,* Ching Yeh Lin, Jennifer L. Hodgson, Michelle L. Coote* and Tamaz Guliashvili*
"Mechanism of Carbon-Halogen Bond Reductive Cleavage in Activated Alkyl Halide Initiators Relevant to Living Radical Polymerization: Theoretical and Experimental Study"***J. Am. Chem. Soc*****. 2011**, *133*, pp. 6254-6264. (Highlighted in C&EN http://pubs.acs.org/isubscribe/journals/cen/89/i08/html/8908scic2.html (From the issue dated February 21, 2011)

23. Tamaz Guliashvili, Julius Tibbelin, Jiyeon Ryu, Henrik Ottosson
"Unsuccessful attempts to add alcohols to transient 2-amino-2-siloxy-silenes - leading to a new benign route for base-free alcohol protection" ***Dalton Transactions*****, 2010**, *39*, 9379-9385.

22. Anders Eklof, Tamaz Guliashvili, Henrik Ottosson
"On the Relation between the pi-Contribution to Reversed Si=C Bond Polarization and the Reaction Profile for the Thermolytic Formation of Silenes"
***Organometallics*****, 2008**, *27*, 5203-5211.

21. Gerard Lligadas, Janine S. Ladislaw, Tamaz Guliashvili and Virgil Percec
"Functionally Terminated Poly(methyl acrylate) by SET-LRP Initiated with $CHBr_3$ and $CHI_3$
*Journal of Polymer Science, Part A,* **2008,** *46 (1),* 278-288.

20. Michael J. Monteiro, Tamaz Guliashvili, Virgil Percec
"Kinetic Simulation of Single Electron Transfer Living Radical Polymerization of Methyl Acrylat at 25 $^{o}$C"
*Journal of Polymer Science, Part A,* **2007**, *45, (10),* 1835 – 1847.

19. Tamaz Guliashvili and Virgil Percec
"A comparative computational study of the homolytic and heterolytic bond dissociation energies involved in the activation step of ATRP and SET-LRP of vinyl monomers"
*Journal of Polymer Science, Part A,* **2007,** *45, (9),* 1607 – 1618.

18. Percec Virgil, Guliashvili Tamaz, Ladislaw Janine S., Wistrand Anna, Stjerndahl Anna, Sienkowska Monika S, Monteiro Michael S., Sahoo Sangrama
"Ultrafast Synthesis of Ultra High Molar Mass Polymers by Metal-Catalyzed Living Radical Polymerization of Acrylates, Methacrylates and Vinyl Chloride Mediated by SET at 25 $^{o}$C" *J. Am. Chem. Soc*. **2006**, *128*, pp. 14156 – 14165 **(cites more than 400 times since 2006)**

17. Virgil Percec, Tamaz Guliashvili, Anatoliy V. Popov.
"Ultrafast Synthesis of Poly(Methyl-Acrylate) (PMA) and PMA-b-PVC-b-PMA by Cu(0)/Me6-TREN Catalyzed Living Radical Polymerization and Block Copolymerization of MA Initiated from $CH_3CHClI$ and α,ω-Di(Iodo) PVC in DMSO".

*Journal of Polymer Science, Part A,* **2005**, *43, (10),* 2178

16. Virgil Percec, Ernesto Ramirez-Castillo, Anatoliy V. Popov, Luis A. Hinojosa-Falcon, Tamaz Guliashvili.
"Ultrafast Single Electron Transfer (SET) / Degenerative Chain Transfer (DT) Mediated Living Radical Polymerization (SET-DTLRP) of Acrylates Initiated with Iodoform in $H_2O$ at Room Temperature"
Journal of Polymer Science, Part A, **2005**, 43, (10), 1948

15. Virgil Percec, Tamaz Guliashvili, Anatoliy V. Popov, Ernesto Ramirez-Castillo.
"Catalytic Effect of DMSO in Cu(0)/Me6-TREN Catalyzed Living Radical Polymerization of MMA at 25 $^{0}$C Initiated from CH3CHClI as Model Compound for the α,ω-Di(Iodo) PVC Chain Ends".
*Journal of Polymer Science, Part A,* **2005**, *43, (9),* 1935

14. Virgil Percec, Tamaz Guliashvili, Anatoliy V. Popov, Ernesto Ramirez-Castillo, Luis A. Hinojosa-Falcon.

"Ultrafast Synthesis of b-PVC-b-PMMA Block Copolymers by C(0)/Me6-TREN Catalyzed Living Radical Copolymerization of MMA Initiated from α,ω-Di(Iodo)PVC in the presence of DMSO at 25 $^{o}$C".
*Journal of Polymer Science, Part A,* **2005,** *43, (8),* 1660

13. Virgil Percec, Tamaz Guliashvili, Anatoliy V. Popov, Ernesto Ramirez-Castillo, Jorge F.J. Coelho, Luis A. Hinojosa-Falcon.
"Accelerated Synthesis of b-PVC-b-PMMA Block Copolymers by CuCl/Me6-TREN Catalyzed Living Radical Copolymerization of MMA Initiated from α,ω-Di(Iodo)PVC in DMSO at 90 $^{o}$C".
*Journal of Polymer Science, Part A,* **2005,** *43,* (*8), 1649*

12. Virgil Percec, Tamaz Guliashvili, Anatoliy V. Popov, Ernesto Ramirez-Castillo
"Synthesis of PMMA-b-PVC-b-PMMA Block Copolymers by CuCl/bpy Catalyzed
Living Radical Copolymerization Initiated from α,ω -Di(Iodo)PVC Prepared by SET-DTLRP"
*Journal of Polymer Science, Part A,* **2005,** *43,* (*7), 1478*

11. Henrik Ottosson, Tamaz Guliashvili, and Ibrahim El-Sayed
Thermolytic Formation and Trapping Reactions of Strongly Reverse-Polarized Silenes
*Organosilicon Chemistry: From Molecules to Materials*, Wiley Inter Science, **2003**. *Vol. 5*, 78
(Book chapter)

10. Tamaz Guliashvili, Ibrahim El-Sayed, Andreas Fischer and Henrik Ottosson.
"The first isolable 2-silenolate"
*Angew. Chem. Int. Ed*, **2003**, *42*, 1640

9. Ibrahim El-Sayed, Tamaz Guliashvili, Rita Hazell, Adolf Gogoll and Henrik Ottosson.
"Evidence for formation of Silenes Strongly Influenced by Reversed Si=C Bond Polarity." *Organic Letters*, **2002**, *4*, 1915

8. Tamaz Guliashvili, Nodar Lekishvili, Levan Asatiani.
"Quantum-Chemical Characterization of Relative Activity of Organo-Silicon
Methacrylates in Radical Copolymerization with Vinylic Monomers"
*Russian Polymer News*, **2001**, *6*, 34

7. Mikhail Latchinov, Nato Chkheidze, Nodar Lekishvili, Levan Asatiani, Tamaz Guliashvili.
"Some kinetic regularities of the bulk radical copolymerization of tetrafluoroalkylmethacrylate with methylmethacrylate" *Proceeding of the Academy of Sciences of Georgia,* **1999**, *25*, 125

6. Mikhail Latchinov, Nato Chkheidze, Nodar Lekishvili, Levan Asatiani, Tamaz Guliashvili
"Kinetics of the bulk radical polymerization of tetrafluoroalkylmethacrylate with
methylmethacrylate" *Russian Polymer News*, **1999**, *4*, 27

5. Nodar Lekishvili, Levan Asatiani, Nino Andguladze, Giorgi Lekishvili, and Tamaz
Guliashvili
"Synthesis and investigation of properties of carbon chain copolymers with elementorganic and hydroxyl groups in the side chain of macromolecules".
*International Journal of Polymeric Materials,* **1998**, *39*, 237

4. Mikhail Latchinov, Tamaz Guliashvili, Nato Chkheidze, Nodar Lekishvili
"Kinetics of bulk radical polymerization of fluoroalkylmethacrylate monomers"
*Polymer Science, series A and B*, (*Vysokomolekuliarnie Soedinenia*), **1998**, *40*, 88

3. Nodar Lekishvili, Levan Asatiani, Tamaz Guliashvili, Lotar Khananashvili
"Reactivity of perfluoroalkyl(meth)acrylates in bulk Radical copolymerization with some vinyl type monomers and properties of their co-polymers."
*International Journal of Polymeric Materials*, **1995**, *27*, 163

2. Nodar Lekishvili, Levan Asatiani, Mzia Kezherashvili, Tamaz Guliashvili, Nana Gdzelidze
"Synthesis and investigation of properties of the copolymers on the basis of
perfluoroalkyl(meth)akrylates and vinylacetylenylcarbinol"
*Proceeding of the Academy of Science of Georgia*, **1993**, *19*, 193

1. Nodar Lekishvili, Levan Asatiani, Tamaz Guliashvili, Mzia Kezherashvili, David Khuroshvili

"Calculation of some quantum-chemical parameters of fluoro(meth)acrylate monomers." *Bulletin of the Academy of Sciences of Georgia*, **1993**, *148*, 234