

Suren L. Kharatyan



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1. Citizenship Armenia
Date of birth September 01, 1948

2. Education, academic degree, title

- Yerevan State University, 1971
- Candidate of Sciences (Chemistry), 1977 (Institute of Chemical Physics NAS RA)
- Doctor of Sciences (Phys.-Math.), 1995 (Institute of Structural Macrokinetics RAS)
- Professor, 2006
- Corr. member of NAS RA, 2010

3. Promotion

- Head of research group Thermodynamics & Kinetics of SHS Processes, Institute of Chemical Physics NAS RA, 1977-1982
- Head of Kinetics of SHS Processes Laboratory, Institute of Chemical Physics NAS of Armenia, 1982-2021
- Head of Macrokinetics of Solid State Reactions Laboratory, Institute of Chemical Physics NAS of Armenia, since 1991
- Head of Chemical Physics Department, YSU, 2002-2007
- Professor, Inorganic & analytical chemistry department YSU, 2007-2021

4. Research interests

- Macrokinetics of high temperature solid state reactions,
- Self-propagating high-temperature synthesis (SHS),
- Chemically activated combustion processes,
- Materials science and technology of inorganic materials,
- Reaction diffusion theory and mathematical modeling.

5. Course of lectures given at the Faculty of Chemistry, YSU

- Macrokinetics,
- Theory of combustion & Explosion,
- Solid state chemistry,
- Theory of reactive diffusion,
- Chemical technology,
- Crystal chemistry,
- Thermodynamics of combustion processes,
- Technological combustion processes in chemistry and metallurgy

6. Membership

Member of Intern. Institute of Combustion, since 1991;

Member of editorial board of the International Journal of Self-Propagating High-Temperature Synthesis since 1999 (Allerton Press, New York)

Member of editorial board of the Chemical Journal of Armenia & deputy editor since 2008

Member of organizing committee of all 15 Intern. Symposium's on SHS (1991-2019)

Member of organizing committee of Intern. Ceramic Congresses CIMTEC, Italy - 2010, 2014, 2016, 2018, 2022

Member of Council of Founders of the "International Association on Self-Propagating High-Temperature Synthesis", 2002;

Member of Council of Founders and executive director of the Fund "Combustion Synthesis and Materials Science", since 2004.

7. Prizes

1999	V. Hambartsumyan Achievement Award for outstanding contribution to the field of combustion physics
2007	Diploma and jubilee medal of the SHS International Association and Chernogolovka's Scientific Center RAS for contribution to science and education
2008	President award of the Republic of Armenia in Natural Sciences

8. Awards

1999-2001	INTAS Award. Development of Scientific Bases of Activated Combustion and Methodologies of Self-Propagating High-Temperature Synthesis (SHS) of Composite Materials Reinforced by SiC Whiskers
2001	ANSEF Award. Processing of Mineral Raw Materials by Application of Advanced Solid Combustion Technology
2000-2002	CRDF Award. Mechanically and chemically activated combustion synthesis of silicon and titanium-based nitride composites for thin film application.
2001-2003	INCO-Copernicus 2. Silicon Nitride based Laminar and Functionally Graded Ceramic Composites for Engineering Application.
2003-2004	NFSAT/CRDF- Award. Kinetics of Rapid High-Temperature Reactions in Gasless Systems: Non-Isothermal Conditions.
2011-2013	11_1d167 SCS grant, "Obtaining nanopowders of refractory metals (W, Mo) by metallothermic reduction of salts"
2013-2015	13_1D192 SCS grant, "Mo-Cu nanocomposite materials. Combustion synthesis and characterization"
2013-2015	13RF-057 SCS grant, "Kinetics of High-temperature Heterogeneous Reactions in the Mechanically Activated Systems"
2015-2016	A-2123 ISTC grant, "Combustion synthesis of W-Cu nanocomposite materials and characterization"
2015-2017	15T-1D196 SCS grant "Solution combustion synthesis of nanoscale non-oxide catalytic systems and characterization. Molybdenum carbide as an example"
2018-2020	18T-1D051 SCS grant "Non-isothermal kinetics of solid-phase reactions. The effect of heating rate"

9. Scholarship: 16 PhD, more than 30 master degree, more than 50 diploma work

10. Publications: more than 300 papers, more than 100 presentations in Intern. conferences, 12 Invention certificates, 1 US patent

List of Selected Publications

1. Kh. Nazaretyan, S. Aydinyan, H. Kirakosyan, D. Moskovskikh, M. Tumanyan, A. Zargaryan, R. Traksmay, S. Kharatyan. "AlCoNiFe and AlCoNiFeCr high entropy alloys: synthesis and interaction pathway at high heating rates". *J Alloys & Compounds*, [Volume 931](#), 10 January 2023, 167589,
2. Marieta Zakaryan, Sina Malakpour Estalaki, Suren Kharatyan, Anna Matzner, Alexander Mukasyan, Tengfei Luo, Khachatur Manukyan. "Spontaneous Crystallization for Tailoring Polymorphism in Nanoscale Nickel with Superior Hardness", *The Journal of Physical Chemistry C*, 2022, 126(29), pp. 12301–12312,
3. Sofiya Aydinyan, Hasmik Kirakosyan; Ani Sargsyan; Olga Volobujeva; Suren Kharatyan. "Solution combustion synthesis of MnFeCoNiCu and (MnFeCoNiCu)₃O₄ high entropy materials and sintering thereof", *Ceramics International*, 2022, 48(14), pp. 20294-20305.
4. Sofiya Aydinyan, Suren Kharatyan, Irina Hussainova, "The Influence of Thermal Dilution on the Microstructure Evolution of Some Combustion- Synthesized Refractory Ceramic composites", *Review, Crystals*, 2022, 12(1), 59.
5. Marieta Zakaryan, Khachik Nazaretyan, Sofiya Aydinyan, and Suren Kharatyan. "Kinetic Highlights of the Reduction of Silver Tungstate by Mg + C Combined Reducer", *Metals*, 2022, 12(6), 1000.
6. M.K. Zakaryan, S.L. Kharatyan, A. Aprahamian, K.V. Manukyan. "Combustion in the ZrF₄-Mg-Si and ZrF₄-Al-Si Systems for Preparation of Zirconium Silicides", *Combustion & Flame*, 232, 2021, 111514.
7. Marieta Zakaryan, Khachik Nazaretyan, Sofiya Aydinyan and Suren Kharatyan, "Joint Reduction of NiO/WO₃ Pair and NiWO₄ by Mg + C Combined Reducer at High Heating Rates", *Metals*, 2021, 11(9), 1351.
8. Sofiya Aydinyan, Suren Kharatyan and Irina Hussainova. "SHS-Derived Powders by Reactions' Coupling as Primary Products for Subsequent Consolidation", *Materials*, 2021, 14, 5117.
9. Hasmik Kirakosyan, Khachik Nazaretyan, Sofiya Aydinyan and Suren Kharatyan. "The Mechanism of Joint Reduction of MoO₃ & CuO Oxides by Combined Mg/C Reducer at High Heating Rates", *Journal of Composites Science*, 2021, 5, 318.
10. N. Amirkhanyan, S. Kharatyan, K. Manukyan, A. Aprahamian, Thermodynamics and Kinetics of Solution Combustion Synthesis: Ni(NO₃)₂+Fuels Systems, *Combustion & Flame* 221, (2020), 110-119.
11. M.K. Zakaryan, Kh.T. Nazaretyan, S.V. Aydinyan, S.L. Kharatyan, NiO reduction by Mg+C combined reducer at high heating rates, *Journal of Thermal Analysis and Calorimetry*, (2021), 146(4), 1811-1817.
12. S.V. Aydinyan, Kh.T. Nazaretyan, A.G. Zargaryan, M.E. Tumanyan, S.L. Kharatyan, Reduction Mechanism of WO₃+CuO Mixture by Combined Mg/C Reducer. Non Isothermal Conditions- High Heating Rates, *Journal of Thermal Analysis and Calorimetry* 133(1), (2018), 261-269.
13. T. Minasyan, H. Kirakosyan, S. Aydinyan, L. Lui, I. Hussainova, S. Kharatyan, Mo-Cu pseudoalloys by combustion synthesis and spark plasma sintering, *Journal of Materials Science* 53(24), (2018), 16598-16608.
14. K.V. Manukyan, Kh. Nazaretyan, Ch.E. Shuck, H.A. Chatilyan, S. Rouvimov, S.L. Kharatyan, A.S. Mukasyan, Kinetics and Mechanism of Ignition in Reactive Al/Ni

- Nanostructured Materials, *The Journal of Physical Chemistry C* 122(47), (2018), 27082-27092.
15. Sofiya Aydinyan, Suren Kharatyan, «Thermally and Kinetically Coupled Reactions at Combustion Synthesis of Materials», Collective monograph ‘Technological combustion’ ed. by C.V. Aldoshin & M.I. Alimov, Part II, chapter 17, pp.429-451 (M. 2018).
 16. S.V. Aydinyan, H.V. Kirakosyan, S.L. Kharatyan Cu-Mo composite powders obtained by combustion-coreduction process”, *Intern. Journal of Refractory Metals and Hard Materials*, 2016, vol. 54, pp. 455-463.
 17. Khachatur V. Manukyan, Arpi G. Avetisyan, Christopher E. Shuck, Hakob A. Chatilyan, Sergei Rouvimov, Suren L. Kharatyan, and Alexander S. Mukasyan. Nickel Oxide Reduction by Hydrogen: Kinetics and Structural Transformations”. *The Journal of Physical Chemistry C*, 2015, 119, 16131–16138.
 18. S.L. Kharatyan, H.A. Chatilyan, M.A. Aghayan, M.A. Rodriguez. “Non-Isothermal Phenomena in the Mo/Si Diffusion Couple: Reaction Kinetics and Structure Formation”, *Int J SHS*, 2013, vol.22, No.1, pp.18-26.
 19. S.L. Kharatyan, A.G. Merzhanov, “Coupled SHS Reactions as a Useful Tool for Synthesis of Materials: An Overview», *Int J SHS*, 2012, vol.21, No.1, pp.59-73.
 20. S.L. Kharatyan, A.G. Merzhanov, “Coupled SHS Reactions as a Useful Tool for Synthesis of Materials: An Overview», *Int J SHS*, 2012, vol.21, No.1, pp.59-73.
 21. A.M. Baghdasaryan, M.A. Hobosyan, H.L. Khachatryan, O.M. Niazyan, S.L. Kharatyan, L.H. Sloyan, Y.G. Grigoryan. “The role of chemical activation on the combustion and phase formation laws in the Ni-Al-Promoter system”, *Chem. Eng. J.* 188 (2012) 210–215.
 22. Khachatur Manukyan, Sofiya Aydinyan, Astxik Aghajanyan, Yeva Grigoryan, Ofik Niazyan, Suren Kharatyan. Reaction pathway in the MoO₃+Mg+C reactive mixtures, *Int J Refract Met Hard Mater* 31 (2012), 28-32.
 23. A.M. Baghdasaryan, M.A. Hobosyan, H.L. Khachatryan, O.M. Niazyan, S.L. Kharatyan, L.H. Sloyan, Y.G. Grigoryan. “The role of chemical activation on the combustion and phase formation laws in the Ni-Al-Promoter system”, *Chem. Eng. J.* 188 (2012) 210–215.
 24. Kh. Manukyan, D. Davtyan, J. Bossert and S. Kharatyan. “Direct Reduction of Ammonium Molybdate to Elemental Molybdenum by Combustion Reaction”. *Chemical Engineering Journal*, 168 (2011) 925–930.
 25. S.V. Aydinyan, Zh. Gumruyan, Kh.V. Manukyan and S.L. Kharatyan. “Self-sustaining reduction of MoO₃ by Mg + C mixture”, *Materials Science and Engineering B* 172 (2010) 267–271.
 26. Kh.V. Manukyan, S.L. Kharatyan, G. Blugan, P. Kocher, J. Kuebler, MoSi₂-Si₃N₄ composites: Influence of starting materials and fabrication route on electrical and mechanical properties, *Journal of the European Ceramic Society* 29, (2009), 2053-2060.
 27. M.H. Yamukyan, Kh.V. Manukyan, S.L. Kharatyan. “Copper oxide reduction by hydrogen under the self-propagation reaction mode”, *J. Alloys Compd.* 479 (2009), 546-549.
 28. Kh.V. Manukyan, S.V. Aydinyan, Kh.G. Kirakosyan, S.L. Kharatyan, G. Blugan, U. Müller, J. Kuebler. “Molten salt-assisted combustion synthesis and characterization of MoSi₂ and MoSi₂-Si₃N₄ composite powders”, *Chem. Eng. J.*, 143 (2008), 331-336.
 29. M.H. Yamukyan, Kh.V. Manukyan, S.L. Kharatyan, Copper oxide reduction by combined reducers under the combustion mode, *Chem. Eng. J.*, (2008), vol.137, No.3, pp.636-642.
 30. S.L. Kharatyan, H.A. Chatilyan, L.H. Arakelyan. “Kinetics of tungsten carbidization under non-isothermal conditions”, *Materials Research Bulletin*, vol.43, issue 4, pp 897-906 (2008).
 31. S.L. Kharatyan, H.A. Chatilyan and G.S. Galstyan. Growth Kinetics of Mo₃Si Layer in the Mo₅Si₃/Mo Diffusion Couple”, *Thin Solid Films*, 516, (2008), 4876-4881.

32. Kh.G Kirakosyan, Kh.V Manukyan, S.L Kharatyan, R.A. Mnatsakanyan, Synthesis of tungsten carbide-carbon nano-materials by combustion reaction, *Materials Chemistry and Physics* 110, (2008), 454-456.
33. H.A. Chatilyan, S.L. Kharatyan, A.B. Harutyunyan. "Diffusion annealing of Mo/MoSi₂ couple and silicon diffusivity in Mo₅Si₃ layer", *Materials Science and Engineering*, A459 (2007), 227-232.
34. A.A. Hambartsumyan, H.L. Khachatryan, A.B. Harutyunyan, S.L. Kharatyan. "Activated Combustion features in the Mo-Si-C-promoter system and synthesis of MoSi₂-SiC composite powders", *Mater. Res. Bull.*, vol.42, issue 12, pp.2082-2089 (2007).
35. Kh.V. Manukyan, S.L. Kharatyan, G. Blugan and J. Kuebler. «Combustion synthesis and compaction of Si₃N₄-TiN composite powder», *Ceramics International*, Vol.33, Issue 3, 2007, pp.379-383.
36. H.L. Khachatryan, A.B. Harutyunyan, S.L. Kharatyan, Activated combustion of Si-C-N₂ and SHS of composite ceramic powders Si₃N₄/SiC and silicon carbide, *Combustion, Explosion and Shock Waves* 42(5), (2006), 543-548.
37. S.L. Kharatyan, H.A. Chatilyan, A.S. Mukasyan, D.A. Simonetti and A. Varma. «Effect of Heating Rate on Kinetics of High-Temperature Reactions: Mo-Si System», *AIChE Journal*, 2005, vol.51, No.1, pp.261-270.
38. S.L. Kharatyan. "Reaction Diffusion in SHS Processes", In book: "Self-Propagating High-Temperature Synthesis. Theory and Practice" [In Russian]. Eds. A. Sytshev, Publisher: "Teritoria", Chernogolovka, Russia, 2001, pp.157-214.
39. S.L. Kharatyan. "Kinetic modeling of tantalum carbidization in combustion wave", *Intern. J SHS*, 1998, vol.7, No.4, pp.439-449.
40. S.L. Kharatyan, E.V. Agababyan, A.G. Merzhanov. "The study of transition metals combustion laws in hydrogen", *Archivum Combustions*, 1985, vol.5, No.1, pp.3-33.

List of Selected Presentations

1. S.L. Kharatyan. "On the thermal instability of metals at joule heating", V Intern. conference "Current problems of Chemical Physics", Yerevan, 25-29 Sept. 2018.
2. S.L. Kharatyan. "Kinetic Features of Nonisothermal Processes. Influence of Heating Rate", V conference of Armenian Chemical Society "Modern problems of theoretical and applied chemistry", Yerevan, Armenia, 3-7 October, 2017, p.15.
3. S.L. Kharatyan. "High Speed Temperature Scanner (HSTS) for Non-Isothermal Kinetic Studies", *III International Conference Nonisothermal Phenomena & Processes: from Thermal Explosion Theory to Structural Macrokinetics, November 28-30, 2016, Chernogolovka (Moscow region, Russia)*, Book of abstracts, pp. 22-23.
4. S.L. Kharatyan "Kinetic features of nickel oxide reduction by hydrogen. An electrothermographic study" (Plenary lecture), IV Intern. Conference "Current problems of Chemical Physics", 5-9 October 2015, Yerevan, Armenia, Book of Abstracts, pp.22-23.
5. A.V. Kirakosyan, L.S. Abovyan, T.M. Trad, Suren L. Kharatyan. "Preparation of Cobalt Powder by Double-Stage SHS Process from Cobalt Sulphate Crystalline Hydrate", invited lecture, XII Intern. Symposium on Self-propagating High-temperature Synthesis (in memory of Professor Alexander Merzhanov), 21-24 October, 2013, South Padre Island, TX, USA, Book of abstracts, pp.112-113.
6. S.L. Kharatyan, "Reactive diffusion in multiphase binary systems: theory and experiment", Intern. Conference on Nonisothermal phenomena and Processes: From Thermal Explosion Theory to Structural Macrokinetics, 27-30 Nov. 2011, Chernogolovka, Book of Abstracts, pp.64-65.

7. S.L. Kharatyan, A.G. Merzhanov, "Coupling reactions in SHS. New possibilities for materials synthesis". XI Intern. Symposium on Self-propagating High-temperature Synthesis, 5-9 September, 2011, Anavyssos, Attica, Greece, Book of abstracts, p.153.
8. S.L. Kharatyan. "Regulation of crystallites size in ceramic SHS". CIMTEC 2010, 12th International Ceramics Congress, Focused Session CB-11.3:IL05, Self-propagating High-Temperature Synthesis of Ceramics, June 6-11, 2010, Montecatini Term, Italy, http://old.cimtec-congress.org/2010/pdf/final_announcement.pdf, p.24. Book of Abstracts, p.41.
9. S.L. Kharatyan. "Metal powders by SHS. Application of organic compounds as effective reducers". X Intern. Symposium on Self-propagating High-temperature Synthesis, 6-11 July, 2009, Tsakhkadzor, Armenia. Book of Abstracts, pp.62-63.
10. S.L. Kharatyan, H.A. Chatilyan. "Growth kinetics of silicide layers in the Si/Mo diffusion couple", 9-th Intern. Symposium on SHS, Dijon, France, 1-5 July, 2007, T1-09.
11. S.L. Kharatyan. "Kinetics of SHS reactions and current state of electrothermography", (plenary lecture), 8th Intern. Symposium on SHS, Cagliari, Italy, 21-24 June, 2005, pp.87-88.
12. S.L. Kharatyan, G.S. Galstyan, A.B. Harutyunyan. "A Diffusion Model for chemical compounds layer growth in multiphase binary systems". 7th Intern. Conference on Diffusion in Materials (DIMAT 2004), Crakow, Poland, 2004.
13. S.L. Kharatyan, H.A. Chatilyan, A.S. Mukasyan and A. Varma. "Influence of heating rate on kinetics of rapid high-temperature reactions in condensed heterogeneous systems", 7th Intern. Symposium on SHS, Crakow, Poland. 2003, p.61.
14. S.L. Kharatyan, "Diffusion kinetics of the solid chemical compounds layers growth in multiphase binary systems. Method of diffusion pairs", Proceedings of the conference "New problems of chemical physics", Yerevan, 7-11 October, 2002, pp. 13-16.
15. S.L. Kharatyan. "Diffusion Kinetics of High-temperature interaction of metals with gas". (invited lecture), Intern. Conference "CIMTEC 2000", "Mass and Charge Transport in Inorganic Materials", Venice, Italy, 2000, p.35.
16. S.L. Kharatyan, H.H. Nersisyan. "Chemically activated SHS in synthesis of refractory carbide powders". First Sino-Russian Workshop on SHS, "Progress of SHS Facing a New Millennium", 21-24 September, 2000, Beijing, China, pp.96-110.
17. S.L. Kharatyan, G.H. Voskerchyan. "Kinetic modeling of combustion waves in SHS systems", First Intern. Symposium on SHS, 23-28 September, 1991, Alma-Ata, p.36.