

CURRICULUM VITAE

Dmitrii Semenok

Bachelor in chemistry
Institute of Chemistry of
Saint-Petersburg State University (2015)

Master degree in material science, Skolkovo Institute
of Science and Technology (2018)

Master degree in physics, Moscow Physical Technical
Institute (MIPT, 2018)

Born: February 10, 1985
Home address:
174 Moscovskoe shosse st.,
apt. 39, Oryol,
Russian Federation, 302025
Phone (home): +7 9092256097
E-mail: dmitrii.semenok@skoltech.ru

Education

September 2018 – Present time

Ph.D. student of Skolkovo Institute of Science and Technology, Material Science track, project: “Computational design of new superconducting materials and its targeted experimental synthesis”, supervisors: Prof. Artem Oganov and Dr. Alex Kvashnin. The result of this work is the following:

[1] D. Semenok et al., “Superconductivity at 161 K in thorium hydride ThH₁₀: Synthesis and properties”, *Materials Today*, **2020**, doi: 10.1016/j.mattod.2019.10.005.

[2] Di Zhou, D. Semenok et al. “Superconducting Praseodymium Superhydrides”, *Science Advances*, **2020**, vol. 6, no. 9, eaax6849. DOI: 10.1126/sciadv.aax6849.

[3] Di Zhou, D. Semenok et al. “High-Pressure Synthesis of Magnetic Neodymium Polyhydrides”. *Journal of the American Chemical Society*, **2020**, 142 (6), 2803-2811. DOI: 10.1021/jacs.9b10439.

[4] D. Semenok et al. “On Distribution of Superconductivity in Metal Hydrides”, *Current Opinion in Solid State & Materials Science*, **2020**, doi:10.1016/j.cossms.2020.100808.

[5] W. Chen, D. Semenok et al. “Superconductivity and Equation of State of Distorted *fcc*-Lanthanum above Megabar Pressures”, *Phys. Rev. B*, 102, 134510 (2020), doi: 10.1103/PhysRevB.102.134510.

[6] I. Kruglov, D. Semenok et al. “Superconductivity of LaH₁₀ and LaH₁₆ polyhydrides”, *Phys. Rev. B* **101**, 024508 (2020), doi: 10.1103/PhysRevB.101.024508.

[7] Wuhao Chen, Dmitrii V. Semenok et al. “High-Pressure Synthesis of Barium Superhydrides: Pseudocubic BaH₁₂”, accepted, *Nature Communications* **2020**.

September 2016 – June 2018

Master student of Moscow Institute of Physics and Technology, Department of General and Applied Physics, major in optics and superconductive physics, average academic grade is 8.43 (out of 10).

September 2016 – June 2018

Master student of Skolkovo Institute of Science and Technology, on Advanced and Digital Engineering Technologies program (CDDM center), major in macromolecular chemistry, average academic grade is A. At the same time I worked in computational lab of Prof. Artem Oganov (USPEX). The result was the following series of publications:

[7] D.V. Semenok et al. “Actinium Hydrides AcH₁₀, AcH₁₂, and AcH₁₆ as High-Temperature Conventional Superconductors”, *The Journal of Physical Chemistry Letters*, 9 (8), pp. 1920-1926 (2018).

[8] A.G. Kvashnin et al. “Iron Superhydrides FeH₅ and FeH₆: Stability, Electronic Properties, and Superconductivity”, *The Journal of Physical Chemistry C*, 122 (8), pp. 4731-4736 (2018).

[9] A. G. Kvashnin, D. V. Semenok et al. “High-Temperature Superconductivity in a Th–H System under Pressure Conditions”, *ACS Appl. Mater. Interfaces*, **2018**, 10 (50), pp. 43809-43816.

[10] D. Semenok et al. "Efficient synthesis of chalcone-4'-sulfonyl chlorides and fluorides", *Tetrahedron Letters*, 59, pp. 372–374 (2018).

[11] D. Semenok et al., "Photopolymerized Two-dimensional Organic Films with Calix[4]arene Scaffold", *Materials Today Communications*, 2020, 101334, doi: 10.1016/j.mtcomm.2020.101334.

August 2015 - September 2016

CEO of Organic Emitters Ltd., a company that had been developing organic LEDs.

September 2011 – August 2015

Student (bachelor) of the Saint-Petersburg State University, Department of Chemistry, major in organic chemistry, average academic achievements for 4 years study is 4.6 points out of 5.

[12] J. Medvedev, D. Semenok, L. Rodina: "Effective Approach to 4,5-Diaryl-3(2H)-Furanones – a Promising Inhibitors for Cyclooxygenase-2", *J. Med. Bio. Sciences*, p.84, 2014.

[13] D. Semenok et al. "Experimental Evidence of Intramolecular CAr–H...O=C Hydrogen Bonds in the Structure of (Diaryl)tetrahydrofuranones Using Spectroscopic Tools", *Helv. Chim. Acta*, 99(9), pp. 716 – 723, 2016.

[14] J. Medvedev, D. Semenok et al., "A New Powerful Approach to Multi-Substituted 3(2H)-Furanones via Brønsted Acid-Catalyzed Reactions of 4-Diazodihydrofuran-3-ones", *Synthesis*, 48(24), pp. 4525-4532, 2016.

[15] D. Semenok et al., "4,5-Diaryl 3(2H)Furanones: Anti-Inflammatory Activity and Influence on Cancer Growth", *Molecules* 24(9), p. 1751, 2019.

[16] D. Semenok et al. "Acid-catalyzed decomposition and stability of diazofuranones: Experimental and mechanistic study", *J Phys Org Chem*. 2019, e4038, doi: 10.1002/poc.4038.

January 2005 - September 2011

Unemployed

September 2002 – January 2005

Student of the Oryol State University (OSU), Department of New Technologies and Industrial Automation, study in the University was interrupted for private reasons.

Experience

July 2019 - Present time

Research intern in Skolkovo Institute of science and Technology (Skoltech, CEST), project "Computational design of new superconducting materials and its targeted experimental synthesis", grants 1-RSCF-1831, 1-RFBR-3432. This project is dedicated to the experimental synthesis and investigation of novel materials based on compressed metallic hydrogen with room-temperature superconductivity.

November 2018 – May 2020

6+6 month internship in Jilin University (HPSTAR, Changchun city, China) in the group of Prof. Tian Cui and Dr. Xiaoli Huang. Project in JU was related to the synthesis and superconducting properties of metal superhydrides (Sr-H, Ba-H, Pr-H and Nd-H systems).

October 2017 – December 2017

Internship in Max Plank Institute Chemistry, Mainz, Germany (group of Prof. M. Eremets). Project in Mainz was dedicated to investigation of superconductivity in Pd-H system under pressure 0-19 GPa.

April 2017 – May 2017

Internship in Camerino University, Camerino, Italy (group of Prof. R. Ballini). Project related to verification of the possibility of effective 3 step synthesis of alkyl 3-alkyl-1H-indole-2-carboxylates by Fischer reaction.

June 2014 – August 2014

Summer internship in Texas Christian University (TCU), Texas (Fort Worth), USA. Study of the possibility of carborane-based vancomycin derivatives synthesis. (3 months, College of Science and Engineering, Texas Christian University, Fort Worth, Texas, USA).

July 2013 – July 2015

(1) Synthesis of promising OLED materials based on phenantro[9.10-b]furan-3(2H)-ones scaffold. (2) Elaboration of a new method for the synthesis of a promising selective inhibitors of the enzyme COX-2 (derivatives of tetrahydrofuran-3-ones) based on the reactions of diazocarbonyl compounds (*Department of Chemistry, Saint-Petersburg State University, Saint-Petersburg, Russia*).

Personal information

In 2016 I was enrolled in Moscow Institute of Physics and Technology (MIPT), on the 2 years master program of Department of General and Applied Physics. Lebedev's Physical Institute (LPI) was my base institution where I worked on the project of synthesis of novel 112-type Fe-containing superconducting pnictides (Prof. V. Pudalov). Another project was dedicated to computer modeling of structure and electronic properties of superconducting hydrides of transition metals, lanthanides and actinides under high pressure. The results of these studies formed the basis of my MSc thesis "Computer modeling of superconducting actinide hydrides using USPEX and Quantum Espresso software" which was defended in June 2018. As all LPI students I passed several courses in quantum optics, radiation theory and theoretical physics.

Along with the study in MIPT I was enrolled in Skolkovo Institute of Science and Technology (Skoltech), on Advanced and Digital Engineering Technologies program (CDDM center) where I performed a project in macromolecular chemistry. In accordance with the requirements of CDMM center I took many courses related to the theory of elasticity, robotics and simulation of stress distribution which interfere with my previous experience. In 2002 – 2005 I was a student of the Oryol State Technical University (OSTU) and attended classes on Dynamics and Strength of Machines track, but didn't finish the full course of education there.

MSc thesis which was defended in June 2018 in Skoltech is called "Synthesis of Compounds Bearing Multiple Photoreactive Units as Potential Connectors to Mediate Infinite Lateral Growth at the Air/Water Interface".

I became a student of the Chemistry Department of St. Petersburg State University in 2011. First year I worked in the laboratory of laser metallization of dielectrics with Dr. V.A. Kochemirovsky at the Institute of Laser Research of SPbSU. Next year I joined the research group of Profs V.A. Nikolaev and L.L. Rodina and finished the course in their lab. My graduate work was dedicated to elaboration of novel approach to promising COX-1/2 inhibitors class of 3(2H)furanones and belongs to the area of the chemistry of aliphatic diazo compounds. The results of these studies were presented on several conferences and papers listed below. During this research process at SPbSU I gained considerable experience in the field of organic and inorganic syntheses as well as in the field of chemical effects of laser radiation.

Research Interests

- ✓ Computational materials science
- ✓ Superconductivity
- ✓ Inorganic and organic synthesis
- ✓ High-pressure chemistry

Languages: English (upper-intermediate), Russian (native).

Main techniques and skills:

1. Computer modeling in USPEX, VASP, Quantum Espresso, Phonopy
2. High-pressure techniques (experiments with diamond anvil cells, DACs) including measurements of superconductivity in DACs
3. PPMS experimental measurements, resistive measurements of superconductive transitions (ambient conditions)
4. Organic and inorganic synthesis, electron microscopy (SEM, EDX)
5. ¹H, ¹³C, ¹¹B, ¹⁹F, ³¹P, HMBC NMR, DEPT, IR, RS, HRMS, ESI-MS, UV spectroscopy
6. X-ray analysis (powder, crystals), X-ray fluorescence analysis, synchrotron XRD (ESRF, SSRF, Spring-8)
7. Gaussian 09, Matlab, Maple, Avogadro, ChemCraft, ChemOffice, CorelDraw, SolidWorks