VASILY MINKOV

Group leader
High-Pressure Chemistry & Physics

CONTACT

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EDUCATION

2008 S.D. (Chemistry)
Novosibirsk, Russia

2011 Ph.D. (Solid State Chemistry)
Novosibirsk, Russia

WORK EXPERIENCE

9/2008 – 8/2016 Novosibirsk State University, Russia

4/2011 – 9/2016 Institute of Solid State Chemistry and Mechanochemistry, Russia

03/2016 – present Max Planck Institute for Chemistry, Germany

INTERESTS

Diamond anvil cell techniques;

High-pressure synthesis, crystal structure, phase diagrams of novel compounds;

Superconductivity;

Spectroscopy, electrical transport, magnetic susceptibility measurements under high pressure.

PROFILE

Vasily Minkov is an expert in static high-pressure experiments using diamond anvil cells. Earlier in his career, he studied structure-property relationship in molecular crystals composed of small organic molecules at hydrostatic pressures up to approximately 10 GPa. In 2016, he joined the laboratory led by Mikhail Eremets, gaining extensive experience while working closely with a leading high-pressure scientist and pioneer of high-temperature superconductivity in hydrides. Since then, Vasily has focused on the development and design of high-pressure apparatus, synthesis of hydrogen-rich compounds, and the adaptation of experimental measurement techniques for extreme high-pressure conditions generated in diamond anvil cells.

While working in Mainz, Vasily contributed to discovery of record high-temperature superconductivity in hydrogen-rich compounds LaH_{10} and YH_9, with critical temperatures reaching approximately 250 K. He played a key role in the development of a miniature non-magnetic diamond anvil cell, enabling the study of superconducting phase diagrams in hydrides under magnetic fields up to 65 Tesla at Los Alamos National Laboratory. He also advanced magnetic susceptibility measurement techniques using SQUID magnetometry to investigate magnetic field screening and flux trapping in hydrogen-rich compounds. A recent major achievement of the group is the first direct measurements of the superconducting gap in H_3S and D_3S using electron tunneling spectroscopy.

Another important accomplishment is the development of the Universal diamond edge Raman scale, which allows pressure estimation in diamond anvil cells up to 500 GPa in laboratory.

KEY PUBLICATIONS

- A. P. Drozdov, P. Kong, V. S. Minkov *et al.* Superconductivity at 250 K in Lanthanum hydride under high pressures. *Nature* **569**, 528 (2019).
- S. Mozaffari, D. Sun, V. S. Minkov *et al.* Superconducting phase diagram of H_3S under high magnetic fields. *Nat. Commun.* **10**, 2522 (2019).
- P. Kong, V. S. Minkov, M. A. Kuzovnikov *et al.* Superconductivity up to 243 K in the Yttrium-Hydrogen system under high pressure. *Nat. Commun.* **12**, 5075 (2021).
- V. S. Minkov, S. L. Bud'ko, F. F. Balakirev *et al.* Magnetic field screening in hydrogen-rich high-temperature superconductors. *Nat. Commun.* **13**, 3194 (2022).
- M. I. Eremets, V. S. Minkov, P. Kong *et al.* Universal diamond edge Raman scale to 0.5 terapascal and implications for the metallization of hydrogen. *Nat. Commun.* **14**, 907 (2023).
- V. S. Minkov, V. Ksenofontov, S. L. Bud'ko *et al.* Magnetic flux trapping in hydrogen-rich high-temperature superconductors. *Nat. Phys.* **19**, 1293 (2023).
- F. Du, A. P. Drozdov, V. S. Minkov *et al.* Superconducting gap of H_3S measured by tunnelling spectroscopy. *Nature* **641**, 619 (2025).