ALEXEY VASIL'EV

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Personal details

Date of birth February 2, 1994,

Languages

English, Russian

Education

Fundamental and Applied Chemistry — Sep 2011 - Sep 2016
Belgorod National Research University
NRU BelSU. Specialist Program in Fundamental and Applied Chemistry
Belgorod,Russia

Graduate School:Condensed Matter Physics in Belgorod National Research University BelSU — Sep 2016 - Sep 2020
Belgorod, Russia

Employment

Junior researcher — Nov 2020 - Dec 2022
Belgorod
BSTU named after V.G. Shukhov (University)

Researcher — May 2022 - Dec 2022
Moscow
NUST MISIS (Moscow Institute of Steel and Alloys, Moscow)
Part-time work within the framework of the Russian Science Foundation project.
Subject of the project: Development and production of thermoelectric materials based on bismuth telluride with ferromagnetic filler

Researcher/Postdoc position — Jan 2023 - Present
Yerevan
LCN Research group in the Institute of Chemical Physics NAS RA

Main research results

Untextured and textured samples based on bismuth telluride Bi1.9Gd0.1Te3, Bi1.9Lu0.1Te2.7Se0.3 with different grain structure (shape and average grain size, orientation factor), which determine the features of their thermoelectric properties, were obtained. properties (electrical resistivity, Seebeck coefficient, total thermal conductivity and thermoelectric figure of merit) of untextured and textured samples based on bismuth telluride (Bi1.9Gd0.1Te3, Bi1.9Lu0.1Te2.7Se0.3) elemental composition of Bi1.9Gd0.1Te3 samples, obtained by cold isostatic pressing and spark plasma sintering, depending on the sintering temperature. The mechanisms of change in the mobility and concentration of the main current carriers, as well as in the thermoelectric properties of Bi1.9Gd0.1Te3 samples with different grain structure and elemental composition, determined both by the methods of obtaining the material and by the sintering temperature, are established. The optimal sintering temperature for Bi1.9Gd0.1Te3 samples obtained by cold isostatic pressing and spark plasma sintering, which ensures the achievement of the maximum thermoelectric figure of merit, has been determined. Size effects in the transport properties of textured Bi1.9Gd0.1Te3 samples with different average grain sizes are identified and analyzed. Preparation methods have been developed (based on solvothermal-microwave synthesis and self-propagating high temperature synthesis of initial powders, and methods of spark plasma sintering and cold isostatic pressing to obtain bulk materials), samples and certification was carried out for the following classes of thermoelectric materials: •High entropy and medium-entropy alloys. • Composites with magnetically active filler. •Textured and non-textured compounds based on bismuth telluride doped with rare earth elements. On the example of compounds from each class of developed materials (BiSbTe1.5Se1.5 - for high entropy and medium-entropy alloys, Ni + Bi2Te3 composite – for composites with magnetically active filler, Bi1.9Gd0.1Te3 and Bi1.9Lu0.1Te3 compounds - for textured and non-textured compounds on the basis of bismuth telluride doped with rare earth elements), the features of their microstructure and thermoelectric properties due to the formation of a specific defect structure are established.

Skills

I have experience in research work on devices: X-ray diffractometer, equipment for measuring thermoelectric properties ZEM-3 (electrical resistivity, Seebeck coefficient), equipment for measuring thermal properties by laser flash method (thermal diffusivity, heat capacity). PhD of Physical and Mathematical
Sciences (2020). Thesis topic: Features of the microstructure and thermoelectric properties of non-textured and textured compounds based on bismuth telluride.
-Experience in synthesis chalcogenide-based 2D materials by various methods such as hydrothermal/solvothermal, CVD, wet chemistry methods.
-Crystal growth skill by self-flux, chemical vapor transport in evacuated quartz ampoules.

List of main publications

1.PHYSICA STATUS SOLIDI-RAPID RESEARCH LETTERS, 2014, 8, 198-201, Ivanov, Oleg ; Danshina, Elena ; Sudzhanskaya, Irina ; Vasil'ev, Alexei - Preparation and dielectric properties of the KBiScNbO6 double perovskite. (Q2)

2. SOLID STATE SCIENCES, 2018, 84, 28-43, Vasil'ev, Alexei ; Yaprintsev, Maxim ; Ivanov, Oleg ; Danshina, Elena - Anisotropic thermoelectric properties of Bi1.9Lu0.1Te2.7Se0.3 textured via spark plasma sintering. (Q3)

3. SEMICONDUCTORS, 2019, 53, 1838-1844, Yaprintsev, M. N. ; Vasil'ev, A. E. ; Ivanov, O. N. ; Zhezhu, M., V - Effect of Spark Plasma Sintering Temperature on Thermoelectric Properties of Grained Bi1.9Gd0.1Te3 Compound. (Q3)

4. SEMICONDUCTORS, 2019, 53, 615-619, Yapryntsev, M. N. ; Vasiliev, A. E. ; Ivanov, O. N. - Influence of the Sintering Temperature on the Thermoelectric Properties of the Bi1.9Gd0.1Te3 Compound. (Q3)

5. SEMICONDUCTORS, 2019, 53, 673-677, Vasil'ev, A. E. ; Yapryntsev, M. N. ; Ivanov, O. N. ; Zhezhu, M. V. - Thermoelectric Properties of Bi2-xLuxTe2.7Se0.3 Solid Solutions. (Q3)

6. JOURNAL OF THE EUROPEAN CERAMIC SOCIETY, 2019, 39, 1193-1205, Yaprintsev, Maxim ; Vasil'ev, Alexei ; Ivanov, Oleg - Sintering temperature effect on thermoelectric properties and microstructure of the grained Bi1.9Gd0.1Te3 compound. (Q1)

7. JOURNAL OF SOLID STATE CHEMISTRY, 2020, 290, 121559, Ivanov, Oleg ; Yaprintsev, Maxim ; Vasil'ev, Alexei - Comparative analysis of the thermoelectric properties of the non-textured and textured Bi1.9Gd0.1Te3 compounds. (Q2)

8. JOURNAL OF THE EUROPEAN CERAMIC SOCIETY, 2020, 40, 3431-3436, Ivanov, Oleg ; Yaprintsev, Maxim; Vasil'ev, Alexei - Anisotropy of the grain size effect on the electrical resistivity of n-type Bi1.9Gd0.1Te3 thermoelectric textured by spark plasma sintering. (Q1)

9. JOURNAL OF THE EUROPEAN CERAMIC SOCIETY, 2020, 40, 742-750, Yaprintsev, Maxim ; Vasil'ev, Alexei ; Ivanov, Oleg - Thermoelectric properties of the textured Bi1.9Gd0.1Te3 compounds spark plasma-sintered at various temperatures. (Q1)

10. JOURNAL OF SOLID STATE CHEMISTRY, 2021, 305, 122696, Zhezhu, Marina ; Vasil'ev, Alexei ; Yaprintsev, Maxim; Ivanov, Oleg ; Novikov, Vseslav - Effect of spark plasma sintering temperature on microstructure and thermoelectric properties of the cermet composites consisting of Bi2Te2.1Se0.9 matrix and Co@CoTe2 inclusions. (Q2)

11. JOURNAL OF ALLOYS AND COMPOUNDS, 2021, 872, 159743, Ivanov, Oleg ; Yaprintsev, Maxim ; Vasil'ev, Alexei ; Yaprintseva, Ekaterina - Microstructure and thermoelectric properties of the medium-entropy block-textured BiSbTe1.5Se1.5 alloy. (Q1)

12. MATERIALS LETTERS, 2021, 290, 129451, Yaprintsev, Maxim ; Vasil'ev, Alexei ; Ivanov, Oleg ; Zhezhu, Marina ; Yaprintseva, Ekaterina ; Novikov, Vseslav - Forming the locally-gradient Ni@NiTe2 domains from initial Ni inclusions embedded into thermoelectric Bi2Te3 matrix. (Q2)

13. JOURNAL OF SOLID STATE CHEMISTRY, 2021, 297, 122047, Yaprintsev, Maxim ; Ivanov, Oleg ; Vasil'ev, Alexei ; Zhezhu, Marina ; Yaprintseva, Ekaterina - Effect of Sm-doping on microstructure and thermoelectric properties of textured n-type Bi2Te2.7Se0.3 compound due to change in ionic bonding fraction. (Q2)

14. SCRIPTA MATERIALIA, 2021, 194, 113710, Yaprintsev, Maxim ; Vasil'ev, Alexei ; Ivanov, Oleg ; Zhezhu, Marina ; Yaprintseva, Ekaterina ; Novikov, Vseslav - Enhanced thermoelectric

efficiency of the bulk composites consisting of "Bi2Te3 matrix" and "filler Ni@NiTe2 inclusions". (Q1)
15. IOP Conference Series: Materials Science and Engineering, 2021, 1014 (1), 012057, A E Vasil'ev, M N Yaprintsev, O N Ivanov, M V Zhezhu, E N Yapryntseva - Synthesis of the high-entropy (BiSbSe Te) Cu compound promising for thermoelectric applications.
16.Nanobiotechnology Reports, 2021, 16 (3), 357-362, A. E. Vasiliev, O. N. Ivanov, M. V. Zhezhu, M. N. Yapryntsev - Synthesis and Properties of Thermoelectric Nanomaterial AgInSe2 with a Chalcopyrite Structure. (Q3)
17. Journal of Solid State Chemistry, 2022, 312, 123176, Yaprintsev, Maxim; Vasil'ev, Alexei ; Ivanov, Oleg ; Popkov, Daniil - Interconnected effects of Sm-doping on grain structure and transport properties of the textured Bi(2-x)Sm(x)Te(2.7)Se(0.3)compounds. (Q2)
18. CHINESE JOURNAL OF PHYSICS, 2022, 77, 24-35, Ivanov, Oleg ; Yaprintsev, Maxim ; Vasil'ev, Alexei ; Zhezhu, Marina ; Novikov, Vseslav - Features of microstructure and thermoelectric properties of the cermet composites based on grained Bi2Te3 matrix with locally-gradient Ni@NiTe2 inclusions. (Q2)
19. GLASS AND CERAMICS, 2022, 79, 3-8, Ivanov, O. N. ; Yapryntsev, M. N. ; Vasil'ev, A. E. ; Dan'shina, E. P. - Influence of Grain Structure Features on the Thermoelectric Properties of Compounds Based on Bismuth Telluride. (Q3)
20. JOURNAL OF ALLOYS AND COMPOUNDS, 2022, 900, 163516, Yaprintsev, Maxim ; Vasil'ev, Alexei ; Ivanov, Oleg - Preparation and characterization of nonstoichiometric Te-deficient and Te-rich thermoelectric Bi2-xGdxTe3 +/- y compounds. (Q1)
21. JOURNAL OF SOLID STATE CHEMISTRY, 2022, 308, 122945, Yaprintsev, Maxim ; Ivanov, Oleg ; Vasil'ev, Alexei - Interconnected effects of direct Gd doping and accompanying indirect Te-stoichiometry destroying on the thermoelectric properties of Te-rich Bi(2-x)Gd(x)Te(3+)y compounds. (Q2)
22. GLASS AND CERAMICS, 2022, 78, 442-447, Ivanov, O. N. ; Yapryntsev, M. N. ; Vasil'ev, A. E. ; Zhezhu, M., V ; Novikov, V. Yu ; Dan'shina, E. P. - Microstructure Features of Metal-Matrix Composites Based on Thermoelectric Bismuth Telluride Matrix and Ferromagnetic Filler. (Q3)
23. MATERIALS LETTERS, 2022, 309, 131416, Yaprintseva, Ekaterina ; Vasil'ev, Alexei ; Yaprintsev, Maxim ; Ivanov, Oleg - Thermoelectric properties of medium-entropy PbSbTeSe alloy prepared by reactive spark plasma sintering. (Q2)
24. SEMICONDUCTORS, 2022, 56, 25-28, Yapryntseva, E. N. ; Ivanov, O. N. ; Vasil'ev, A. E. ; Yapryntsev, M. N. - Microstructure and Thermoelectric Properties of Medium-Entropy BiSbTe1.5Se1.5 and PbSnTeSe Compounds Prepared by Reactive Spark Plasma Sintering. (Q3)
25. Glass and Ceramics, 2022, 79 (7-8), 323-329, I. V. Sudzhanskaya, A. E. Vasil'ev, M. N. Yapryntsev, Yu. S. Nekrasova, A. N. Oleinik - Ce0.8Y0.2O2–δ — Effect of Production Method on Structure and Electrophysical Properties. (Q3)
26. Glass and Ceramics, 2022, 79 (5-6), 180-184, O. N. Ivanov, M. N. Yapryntsev, A. E. Vasil'ev, M. V. Zhezhu, V. V. Khovailo - Metal-Ceramic Composite Bi2Te3–Gd: Thermoelectric Properties. (Q3)
27. Glass and Ceramics, 2023, 80 (5-6), 254-260, A. E. Vasil'ev, O. N. Ivanov, M. N. Yapryntsev, M. Zhezhu - Features of the Microstructure and Thermoelectric Properties of Bi2Te2.7Se0.3 + Fe Composites with Core–Shell Filler Inclusions. (Q3)

28. Materials Letters, 2023, 346, 134568, Ekaterina Yaprintseva, Alexei Vasil'ev, Maxim Yaprintsev, Oleg Ivanov - Preparation and thermoelectric properties of high-entropy (Bi2/3Sb1/3)2(Te2/5Se2/5S1/5)3 alloy. (Q2)
29. Bulletin of the Russian Academy of Sciences: Physics, 2023, 87 (6), 687-691, M. Zhezhu, A. E. Vasil'ev, O. N. Ivanov - Patterns of the Effect of the Temperature of Spark Plasma Sintering on the Microstructure of Thermoelectric Composites Based on the Matrix of Bi2Te2.1Se0.9Bi2 with Cobalt Inclusions. (Q3)
30. Glass and Ceramics, 2023, 80 (1-2), 52-57, A. E. Vasil'ev, O. N. Ivanov, M. N. Yapryntsev, E. N. Yapryntseva, A. V. Efremenko - Aspects of the Microstructure and Thermoelectric Properties of a Two-Phase Ceramic Material Based on the High-Entropy System Bi–Sb–Te–Se–S. (Q3)
31. Journal of Alloys and Compounds, 2023, 938, 168564, Marina Zhezhu, Oleg Ivanov, Maxim Yaprintsev, Alexei Vasil'ev - Effect of locally-gradient Ni@NiTe2 inclusions on the Seebeck coefficient of Bi2Te3 + xNi composites. (Q1)
32. Solid State Sciences, 2023, 135, 107083, Maxim Yaprintsev, Alexei Vasil'ev, Oleg Ivanov, Daniil Popkov, Egor Kudryavtsev - Comparative analysis of morphology 1D and 2D particles effect in starting powders on microstructure and thermoelectric properties of grained Bi2Te2.7Se0.3 compound. (Q2)
33. Physica Scripta, 2024, 99 (2), 025913, O Ivanov, M Yaprintsev, E Yaprintseva, T Nickulicheva, A Vasil'ev - Topological insulator behavior in low-temperature electrical resistivity of the high-entropy single-crystalline thick-filmed (Bi Sb) (Te Se S) alloy. (Q2)
34. Colloid and Interface Science Communications, 2024, 58, 100766, Y. Melikyan, H. Gharagulyan, A. Vasil'ev, V. Hayrapetyan, M. Zhezhu, A. Simonyan, D.A. Ghazaryan, M.S. Torosyan, A. Kharatyan, J. Michalicka - E-beam induced micropattern generation and amorphization of L-cysteine-functionalized graphene oxide nano-composites
35. Physica Scripta, 2024, 99 (3), 035960, O Ivanov, M Yaprintsev, E Yaprintseva, T Nickulicheva, A Vasil'ev - Temperature evolution of transverse magnetoresistance due to forming the topological insulator state in single-crystalline n-type Bi Te Se (Q2)
36.Materials Research Bulletin, 2024, 180, 113036, A. Vasil'ev, Y. Melikyan, M. Zhezhu, V. Hayrapetyan, M.S. Torosyan, D.A. Ghazaryan, M. Yeranosyan, H. Gharagulyan - Improving the electro-optical properties of MoS2/rGO hybrid nanocomposites using liquid crystals (Q1).
37.Materialia, 2024, 36, 102172, M. Zhezhu, A. Vasil'ev, O. Ivanov, M. Yaprintsev, E. Yaprintseva - Effects of locally-gradient Co-doping on the electron properties of BiTeSe + 0.33 wt.% Co composite (Q2).
38. Soft Matter 2024 Sergey Shvetsov, Tetiana Orlova, Aleksandr Hayrapetyan, Alexey Vasil'ev, Mushegh Rafayelyan Light-controllable liquid crystal platform for microparticle oscillations and transport (Q1).