

Maksim S. Rakitin

Bio

Personal details

Full name: Maksim S. Rakitin

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Education and training

2008.10–2012.09

**Ph.D. in Condensed Matter Physics (defended on September 19, 2012)***South Ural State University (National Research University), Chelyabinsk, Russia*

2006.09–2008.06

M.S. in Applied Mathematics and Physics (June 13, 2008)*South Ural State University (SUSU), Chelyabinsk, Russia*

2002.09–2006.06

B.S. in Applied Mathematics and Physics (June 20, 2006), *summa cum laude**South Ural State University (SUSU), Chelyabinsk, Russia*

Research and professional expertise

2017.11–present

**Associate Computational Scientist, DAMA group, NSLS-II, Brookhaven National Laboratory, Upton, NY** (<https://www.bnl.gov>)

2015.12–2017.10

Research Associate (Postdoc), NSLS-II, Brookhaven National Laboratory, Upton, NY (<https://www.bnl.gov>)

2013.10–2015.12

**Postdoctoral Associate (Postdoc), Department of Geosciences, Stony Brook University, Stony Brook, NY** (<https://stonybrook.edu>, <https://uspex-team.org/en>)

2007.06–2013.10

**QA Engineer, QA Team Leader, Applied Technologies Ltd., Chelyabinsk, Russia** (<http://www.appliedtech.ru>), a partner of Rocket Software Inc., USA (<https://www.rocketsoftware.com>)

Software projects

- **Bluesky** — a library for experiment control and collection of scientific data and metadata, <https://blueskyproject.io/bluesky>.
- **Ophyd** — a device abstraction library, <https://blueskyproject.io/ophyd>.
- **Databroker** — a simple, user-friendly interface for retrieving stored data and metadata from multiple sources, <https://blueskyproject.io/databroker>.
- **Synchrotron Radiation Workshop (SRW)** — computer code for X-ray source and optics simulations, <https://github.com/mrakitin/SRW>.
- **Sirepo** — a cloud-based framework for SRW, <https://github.com/radiasoft/sirepo>.
- **Databroker extractor** — image processing and data visualization, <https://github.com/mrakitin/databroker-extractor>.
- **CRL simulator** — a code for simulation of a transfocator (compound refractive lenses (CRL) for X-ray focusing), <https://github.com/mrakitin/bnclrl>.
- **USPEX** — a code for evolutionary crystal structure prediction, <https://uspex-team.org/en>.

- **USPEX online utilities** — a set of pre- and post-processing tools for crystal structure simulations, <http://han.ess.sunysb.edu>.
- **USPEX manual** — http://han.ess.sunysb.edu/uspex_manual.
- Utilities for DFT simulations
- IBM Mainframe software projects

Publications

39. D. Leshchev, M. Rakitin, B. Luvizotto, R. Kadyrov, B. Ravel, K. Attenkofer, and E. Stavitski, "The Inner Shell Spectroscopy beamline at NSLS-II: a facility for in situ and operando X-ray absorption spectroscopy for materials research," *Journal of Synchrotron Radiation*, vol. 29, no. 4, Jul. 2022. <https://doi.org/10.1107/S160057752200460X>
38. D. Hidas, A. M. Kiss, M. Rakitin, J. Sinsheimer, T. Tanabe, and M. Musardo, "High precision real-time insertion device and monochromator synchronization at NSLS-II," *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, vol. 1031, p. 166505, Mar. 2022. <https://doi.org/10.1016/j.nima.2022.166505>
37. B. Nash, D. T. Abell, D. L. Bruhwiler, E. G. Carlin, Y. Du, J. P. Edelen, A. Giles, M. V. Keilman, J. Lynch, J. Maldonado, P. Moeller, R. Nagler, I. V. Pogorelov, M. S. Rakitin, A. Walter, and S. D. Webb, "X-Ray Beamline Control with Machine Learning and an Online Model," in *Proc. ICALEPCS'21*, ser. International Conference on Accelerator and Large Experimental Physics Control Systems, no. 18. JACoW Publishing, Geneva, Switzerland, Dec. 2021, pp. 695–699. <https://doi.org/10.18429/JACoW-ICALEPCS2021-WEVP024>
36. R. Jain, D. Abel, M. Rakitin, M. Sullivan, D. T. Lodowski, M. R. Chance, and E. R. Farquhar, "New high-throughput endstation to accelerate the experimental optimization pipeline for synchrotron X-ray footprinting," *Journal of Synchrotron Radiation*, vol. 28, no. 5, pp. 1321–1332, Sep. 2021. <https://doi.org/10.1107/S1600577521005026>
35. L. Yang, E. Lazo, J. Byrnes, S. Chodankar, S. Antonelli, and M. Rakitin, "Tools for supporting solution scattering during the COVID-19 pandemic," *Journal of Synchrotron Radiation*, vol. 28, no. 4, pp. 1237–1244, Jul. 2021. <https://doi.org/10.1107/S160057752100521X>
34. T. Konstantinova, L. Wiegart, M. Rakitin, A. M. DeGennaro, and A. M. Barbour, "Noise reduction in X-ray photon correlation spectroscopy with convolutional neural networks encoder–decoder models," *Sci Rep*, vol. 11, no. 1, Jul. 2021. <https://doi.org/10.1038/s41598-021-93747-y>
33. M. S. Rakitin and A. A. Mirzoev, "Ab initio Simulation of Dissolution Energy and Bond Energy of Hydrogen with 3sp, 3d, and 4d Impurities in bcc Iron," *Phys. Solid State*, vol. 63, no. 7, pp. 1065–1068, Jul. 2021. <https://doi.org/10.1134/S1063783421070180>
32. S. I. Campbell, D. B. Allan, A. M. Barbour, D. Olds, M. S. Rakitin, R. Smith, and S. B. Wilkins, "Outlook for artificial intelligence and machine learning at the NSLS-II," *Machine Learning: Science and Technology*, vol. 2, no. 1, p. 013001, Mar. 2021. <https://doi.org/10.1088/2632-2153/abbd4e>
31. O. Chubar, L. Wiegart, S. Antipov, R. Celestre, R. Coles, A. Fluerasu, and M. Rakitin, "Analysis of hard x-ray focusing by 2D diamond CRL," in *Advances in Computational Methods for X-Ray Optics V*, O. Chubar and K. Sawhney, Eds., vol. 11493, International Society for Optics and Photonics. SPIE, Aug. 2020, pp. 119–127. <https://doi.org/10.1117/12.2568980>
30. O. Chubar, R. A. Coles, L. Wiegart, A. Fluerasu, M. Rakitin, J. Condie, P. Moeller, and R. Nagler, "Simulations of coherent scattering experiments at storage ring synchrotron radiation sources in the hard x-ray range," in *Advances in Computational Methods for X-Ray Optics V*, O. Chubar and K. Sawhney, Eds., vol. 11493, International Society for Optics and Photonics. SPIE, Aug. 2020, pp. 201–208. <https://doi.org/10.1117/12.2568833>
29. A. He, O. Chubar, M. Rakitin, L. Samoylova, C. Fortmann-Grote, S. Yakubov, and A. Buzmakov, "Parallel performance of "Synchrotron Radiation Workshop" code: partially coherent calculations for storage rings and time-dependent calculations for XFELs," in *Advances in Computational Methods for X-Ray Optics V*, O. Chubar and K. Sawhney, Eds., vol. 11493, International Society for Optics and Photonics. SPIE, Aug. 2020, pp. 78–87. <https://doi.org/10.1117/12.2567448>
28. M. S. Rakitin, A. Giles, K. Swartz, J. Lynch, P. Moeller, R. Nagler, D. B. Allan, T. A. Caswell, L. Wiegart, O. Chubar, and Y. Du, "Introduction of the Sirepo-Bluesky interface and its application to the optimization problems," in *Advances in Computational Methods for X-Ray Optics V*, O. Chubar and K. Sawhney, Eds., vol. 11493, International Society for Optics and Photonics. SPIE, Aug. 2020, pp. 209–226. <https://doi.org/10.1117/12.2569000>
27. B. Nash, O. Chubar, D. Bruhwiler, M. Rakitin, P. Moeller, R. Nagler, and N. Goldring, "Undulator radiation brightness calculations in the Sirepo GUI for SRW," in *Advances in Laboratory-based X-Ray Sources, Optics, and Applications VII*, A. Murokh and D. Spiga, Eds., vol. 11110, International Society for Optics and Photonics. SPIE, 2019, pp. 79–92. <https://doi.org/10.1117/12.2530663>
26. B. Nash, N. Goldring, D. L. Bruhwiler, O. Tchoubar, A. He, M. Rakitin, R. Nagler, and P. Moeller, "Phase IIA Final Technical Report for "Development of software framework for x-Ray optics simulation and modeling"," Jul. 2019. <https://www.osti.gov/biblio/1532614>

25. D. Allan, T. Caswell, S. Campbell, and M. Rakitin, "Bluesky's Ahead: A Multi-Facility Collaboration for an a la Carte Software Project for Data Acquisition and Management," *Synchrotron Radiation News*, vol. 32, no. 3, pp. 19–22, 2019. <https://doi.org/10.1080/08940886.2019.1608121>
24. L. Wiegart, M. Rakitin, Y. Zhang, A. Fluerasu, and O. Chubar, "Towards the simulation of partially coherent x-ray scattering experiments," *AIP Conference Proceedings*, vol. 2054, no. 1, p. 060079, 2019. <https://doi.org/10.1063/1.5084710>
23. B. Nash, O. Chubar, N. Goldring, D. L. Bruhwiler, P. Moeller, R. Nagler, and M. Rakitin, "Detailed x-ray brightness calculations in the sirepo GUI for SRW," *AIP Conference Proceedings*, vol. 2054, no. 1, p. 060080, 2019. <https://doi.org/10.1063/1.5084711>
22. M. S. Rakitin, P. Moeller, R. Nagler, B. Nash, D. L. Bruhwiler, D. Smalyuk, M. Zhernenkov, and O. Chubar, "Sirepo: an open-source cloud-based software interface for X-ray source and optics simulations," *Journal of Synchrotron Radiation*, vol. 25, no. 6, pp. 1877–1892, Nov. 2018. <https://doi.org/10.1107/S1600577518010986>
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19. M. Rakitin, A. A. Mirzoev, and D. A. Mirzaev, "First-Principles and Thermodynamic Simulation of Elastic Stress Effect on Energy of Hydrogen Dissolution in Alpha Iron," *Russian Physics Journal*, vol. 60, no. 12, pp. 2136–2143, Apr. 2018. <https://doi.org/10.1007/s11182-018-1337-2>
18. M. S. Rakitin, O. Chubar, P. Moeller, R. Nagler, and D. L. Bruhwiler, "Sirepo: a web-based interface for physical optics simulations - its deployment and use at NSLS-II (*invited paper*)," in *Proc. SPIE, Advances in Computational Methods for X-Ray Optics IV (23 August 2017)*, vol. 10388, 2017, p. 103880R. <https://doi.org/10.1117/12.2274031>
17. O. Chubar, M. Rakitin, Y.-C. Chen-Wiegart, A. Fluerasu, and L. Wiegart, "Simulation of experiments with partially coherent x-rays using Synchrotron Radiation Workshop code," in *Proc. SPIE, Advances in Computational Methods for X-Ray Optics IV (23 August 2017)*, vol. 10388, 2017, p. 1038811. <https://doi.org/10.1117/12.2274481>
16. O. Chubar, M. Rakitin, Y.-C. Chen-Wiegart, Y. S. Chu, A. Fluerasu, D. Hidas, and L. Wiegart, "Main functions, recent updates, and applications of Synchrotron Radiation Workshop code (*invited paper*)," in *Proc. SPIE, Advances in Computational Methods for X-Ray Optics IV (23 August 2017)*, vol. 10388, 2017, p. 103880S. <https://doi.org/10.1117/12.2274285>
15. L. Wiegart, M. Rakitin, A. Fluerasu, and O. Chubar, "X-ray optical simulations supporting advanced commissioning of the coherent hard x-ray beamline at NSLS-II," in *Proc. SPIE, Advances in Computational Methods for X-Ray Optics IV (23 August 2017)*, vol. 10388, 2017, p. 103880N. <https://doi.org/10.1117/12.2274403>
14. M. Idir, M. Rakitin, B. Gao, J. Xue, L. Huang, and O. Chubar, "Alignment of KB mirrors with at-wavelength metrology tool simulated using SRW," in *Proc. SPIE, Advances in Computational Methods for X-Ray Optics IV (23 August 2017)*, vol. 10388, 2017, p. 103880Z. <https://doi.org/10.1117/12.2274264>
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12. O. V. Chubar, T. A. Caswell, Y. Chen-Wiegart, A. Fluerasu, Y. Hidaka, D. A. Hidas, C. A. Kitegi, M. S. Rakitin, T. Tanabe, J. Thieme, L. Wiegart, and G. Williams, "Analysis and Correction of in-Vacuum Undulator Misalignment Effects in a Storage Ring Synchrotron Radiation Source," in *Proc. of International Particle Accelerator Conference (IPAC'17), Copenhagen, Denmark, 14–19 May, 2017*, ser. International Particle Accelerator Conference, no. 8. Geneva, Switzerland: JACoW, May 2017, paper TUPAB140, pp. 1663–1665. <https://doi.org/10.18429/JACoW-IPAC2017-TUPAB140>
11. A. Blednykh, B. Bacha, G. Bassi, O. V. Chubar, M. S. Rakitin, V. V. Smaluk, and M. Zhernenkov, "A Comprehensive Study of the Microwave Instability," in *Proc. of International Particle Accelerator Conference (IPAC'17), Copenhagen, Denmark, 14–19 May, 2017*, ser. International Particle Accelerator Conference, no. 8. Geneva, Switzerland: JACoW, May 2017, paper WEPIK117, pp. 3224–3226. <https://doi.org/10.18429/JACoW-IPAC2017-WEPIK117>
10. D. A. Mirzaev, A. A. Mirzoev, and M. S. Rakitin, "Alloying Effects on Thermodynamic Characteristics of Hydrogen in BCC Iron," *Bulletin of the South Ural State University, Ser. Metallurgy*, vol. 16, no. 4, pp. 40–53, 2016, Original Russian Text. <https://doi.org/10.14529/met160405>
9. Y. H. R. Chang, T. L. Yoon, T. L. Lim, and M. Rakitin, "Thorough investigations of the structural and electronic properties of $\text{Al}_x\text{In}_{1-x}\text{N}$ ternary compound via *ab initio* computations," *Journal of Alloys and Compounds*, vol. 682, pp. 338–344, 2016. <https://doi.org/10.1016/j.jallcom.2016.04.281>

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7. M. S. Rakitin, A. R. Oganov, H. Niu, M. M. Davari Esfahani, X.-F. Zhou, G.-R. Qian, and V. L. Solozhenko, "A novel phase of beryllium fluoride at high pressure," *Phys. Chem. Chem. Phys.*, vol. 17, pp. 26 283–26 288, 2015. <https://doi.org/10.1039/C5CP04010H>
6. A. R. Oganov, C. W. Glass, A. O. Lyakhov, Q. Zhu, G.-R. Qian, H. T. Stokes, M. S. Rakitin, M. Davari, P. Bushlanov, Z. Allahyari, and S. Lepeshkin, *USPEX manual: Universal Structure Predictor: Evolutionary Xtallography*, 2013–2015. <https://uspex-team.org/en/uspex/documentation>
5. D. A. Mirzaev, A. A. Mirzoev, K. Y. Okishev, and M. S. Rakitin, "Theory of hydrogen solubility in binary iron alloys based on *ab initio* calculation results," *Molecular Physics*, vol. 110, no. 11-12, pp. 1299–1304, 2012. <https://doi.org/10.1080/00268976.2011.645895>
4. A. V. Ursaeva, M. S. Rakitin, G. E. Ruzanova, and A. A. Mirzoev, "Ab initio study of hydrogen interaction with point defects in bcc iron," *Bulletin of the South Ural State University: Math., Mech. and Phys.*, vol. 4, no. 10, pp. 114–119, 2011, Original Russian Text. <https://vestnik.susu.ru/mmph/issue/viewFile/46/22#page=114>
3. A. A. Mirzoev, D. A. Mirzaev, and M. S. Rakitin, "Impurities influence on dissolution of hydrogen in bcc iron," *Bulletin of the South Ural State University: Math., Mech. and Phys.*, vol. 4, no. 10, pp. 77–83, 2011, Original Russian Text. <https://vestnik.susu.ru/mmph/issue/viewFile/46/22#page=77>
2. M. S. Rakitin, A. A. Mirzoev, and D. A. Mirzaev, "Change of electronic structure in iron containing interstitial atoms of hydrogen," *Bulletin of the South Ural State University: Metallurgy*, vol. 14, no. 13, pp. 67–71, 2010, Original Russian Text. <https://vestnik.susu.ru/metallurgy/issue/archive>
1. A. A. Mirzoev, M. M. Yalalov, and M. S. Rakitin, "Dependence of TB-LMTO calculations accuracy on *k*-points number: effect of iterations mixing parameter using Broyden scheme," *Bulletin of the South Ural State University: Math., Phys. and Chem.*, vol. 6, no. 6, pp. 103–105, 2005, Original Russian Text. <https://vestnik.susu.ru/mmph/issue/viewFile/36/12#page=103>