Artem **LUNEV**

Candidate of Sciences (PhD)

+7 (991) 920 55 32 @ artem.v.lunev@gmail.com
Novoyasenevsky Prospekt 3-252, Moscow 117558, Russia
Born 16 September 1988 in Moscow, USSR
github.com/kotik-coder researchgate.net/profile/Artem_Lunev

A cross-disciplinary researcher and proactive developer of scientific instruments specialising in thermal analysis and in nuclear materials applications. Good experience in successfully delivering R&D projects under tight deadlines. Skilled in statistical data analysis and numerical modelling. Committed developer of open-source projects.

Skills

Thermal analysis	Differential Scanning Calorimetry (DSC), Differential Thermal Analysis (DTA), Thermogravimetric Analysis (TGA), Dilatometry, Laser Flash Analysis (LFA)
Spectral methods	Raman Spectroscopy, X-Ray Diffraction (XRD) and Photoelectron Spectroscopy (XPS), Energy-Dispersive Spectroscopy (EDX), Electron Backscatter Diffraction (EBSD), γ-spectroscopy
Microscopy	Scanning Electron Microscopy (SEM), Digital Microscopy, Confocal Laser Scanning Microscopy (CLSM), Atomic Force Microscopy (AFM)
Sample preparation	Mechanical Grinding and Polishing (Buehler, Struers), Chemical Etching, High-precision Cutting, Electrical Discharge Machining (EDM), Magnetron Sputtering, Coating
Material fabrication	Sintering, Hot Isostatic Pressing (HIP), Cold Pressing
Numerical methods	Finite-Difference Method, Numerical Optimisation, Classical Molecular Dynamics, Discrete Dislocation Dynamics, Discrete Ordinates Method
Programming Languages	Java, C#

Languages

Russian	●●●●●
English	●●●●●
Português	●●●○○
Français	●●○○○

Awards

- Young Researcher Award (NuMat2016, 2nd place)
- Presidential Scholarship (2012-2014)
- IAEA Grants-in-Aid (2013, 2016)

Professional Experience

Present – March 2022 — **Postdoctoral Researcher, ITMO University, Russia**

- XRD characterisation of metal organic framework (MOF) samples
- Thermal calculations in micron-sized particles
- Thermogravimetric analysis

XRD | TGA

February 2022 – February 2021 — **Project Manager R&D, Netzsch Analyzing & Testing, Germany**

- Hardware development of existing and new Laser Flash Analysis (LFA) instruments
- Development of mathematical models and their software implementation in Netzsch Proteus
- Public outreach (Digital Sales Meetings)
- General technical support for sales

LFA | Project Management | C# | Mechanical Engineering | Electronics

December 2020 – November 2017 — **Experimental Materials Scientist, United Kingdom Atomic Energy Authority (UKAEA), UK**

- Responsible officer (RO) for the Laser Flash Analyser and Deputy RO for the Simultaneous Thermal Analyser and Dilatometer
- Leader of the High-temperature Materials branch within the iMeter research package managed by Chris Hardie
- Supervised a young graduate (George Fulton) and a summer placement student (Robert Heymer)
- Provided input for the procurement of a high-vacuum DSC, a nanocalorimetry device and a thermoreflectance analyser
- Lead developer of the PULsE software for laser flash analysers

LFA | DSC | STA | Dilatometry | Raman spectroscopy | CLSM | XPS | Nanoindentation | SEM | EBSD | AFM | Sample preparation | Finite-Difference Method | Discrete Ordinates Method | Java

December 2018 – January 2016 | **Research Fellow, Joint Institute for High Temperatures (JIHT), Russia**

- Fellowship supported by the Russian Foundation for Basic Research (RFBR), grant no. 16-38-60016\15
- Massively parallel simulations of dislocation motion in crystals using LAMMPS on supercomputers of the Russian Academy of Sciences
- Development of a 2D dislocation dynamics code for meso-scale simulation of dislocation ensembles

Classical Molecular Dynamics | Supercomputers | MPI | Discrete Dislocation Dynamics

December 2015 – June 2015 | **Engineer, Kurchatov Institute, Russia**

- Assisted with experimental characterisation of Nb_3Ti superconducting tapes irradiated with high-energy protons
- Conducted γ-spectroscopy on irradiated samples to infer the isotopic composition

Gamma spectroscopy | TEM | FIB | SEM | Cyclotrons

June 2015 – May 2011 | **Engineer, National Research Nuclear University (NRNU MEPhI), Russia**

- Conducted experimental analysis of thermal decomposition in Gen IV uranium nitride and mixed nitride nuclear fuels
- Tested the feasibility of using warm pressing as a preparatory plastification stage for oxide nuclear fuel fabrication
- Assisted with the development of a laser flash analyser and the associated software
- Participated in the optimisation of sintering technology for nuclear fuel pellets
- Principal investigator: *Ion irradiation experiments for reproducing the high burn-up structure in oxide nuclear fuel*, supported by the Presidential Council for Grants and the Russian Ministry of Education and Science
- Co-investigator in commercial contracts with JSC TVEL and Rosatom

TGA | STA | DSC | Dilatometer | Sintering | HIP | LFA | Sample preparation | XRD | AFM | SEM

Education

2011-2014 Candidate of Sciences (≈PhD) in Condensed Matter Physics. Degree awarded by the National Research Nuclear University (MEPhI). Thesis: *Modelling of the high burn-up structure in oxide nuclear fuel* (Scientific Advisor: Prof. V. G. Baranov)

2005-2011 Specialist (≈MSc) in Engineering Physics with a major in Physical Metallurgy and Materials in Extreme Environments. Qualification awarded by the National Research Nuclear University (MEPhI). Thesis: *Molecular dynamics simulation of thermal conductivity in uranium dioxide* (Scientific Advisor: Assoc. Prof. A. V. Nazarov)

Publications

[1] Lunev, A., Lauerer, A., Zborovskii, V. & Léonard, F. Digital twin of a laser flash experiment helps to assess the thermal performance of metal foams. *International Journal of Thermal Sciences* **181**, 107743 (2022). URL **https://doi.org/10.1016/j.ijthermalsci.2022.107743**.

[2] Lauerer, A. & Lunev, A. Experimental evidence of gas-mediated heat transfer in porous solids measured by the flash method. *SSRN Electronic Journal* (2022). URL **https://doi.org/10.2139/ssrn.4119268**.

[3] Kuksenko, V. *et al.* Radiation induced hardening of beryllium during low temperature he implantation. *Journal of Nuclear Materials* **555**, 153130 (2021). URL **https://doi.org/10.1016/j.jnucmat.2021.153130**.

[4] Lunev, A., Zborovskii, V. & Aliev, T. Complexity matters: Highly-accurate numerical models of coupled radiative–conductive heat transfer in a laser flash experiment. *International Journal of Thermal Sciences* **160**, 106695 (2021). URL **https://doi.org/10.1016/j.ijthermalsci.2020.106695**.

[5] Lunev, A., Zborovskii, V., Aliev, T., Heymer, R. & Vilkhivskaya, O. PULsE: An open-source software for laser flash analysis. *Software Impacts* **6**, 100044 (2020). URL **https://doi.org/10.1016/j.simpa.2020.100044**.

[6] Lunev, A. & Heymer, R. Decreasing the uncertainty of classical laser flash analysis using numerical algorithms robust to noise and systematic errors. *Review of Scientific Instruments* **91**, 064902 (2020). URL **https://doi.org/10.1063/1.5132786**.

[7] Aucott, L. *et al.* Solid-state diffusion bonding of glass-metal for the international thermonuclear experimental reactor (ITER) diagnostic windows. In *TMS 2020 149th Annual Meeting & Exhibition Supplemental Proceedings*, 2085–2094 (Springer, 2020).

[8] Fulton, G. & Lunev, A. Probing the correlation between phase evolution and growth kinetics in the oxide layers of tungsten using raman spectroscopy and ebsd. *Corrosion Science* **162**, 108221 (2020). URL **https://doi.org/10.1016/j.corsci.2019.108221**.

[9] Lunev, A., Starikov, S., Aliev, T. & Tseplyaev, V. Understanding thermally-activated glide of 1/2<110>110 screw dislocations in UO_2 – a molecular dynamics analysis. *International Journal of Plasticity* **110**, 294 – 305 (2018). URL **https://doi.org/10.1016/j.ijplas.2018.07.003**.

[10] Lunev, A. *et al.* On morphological and microstructural changes in uranium dioxide powder during binder-free hot pressing. *Defect and Diffusion Forum* **375**, 114–122 (2017). URL **http://dx.doi.org/10.4028/www.scientific.net/DDF.375.114**.

[11] Vasilev, A. L. *et al.* On the possible separation of the phase enriched with nb in superconducting intermetallic Nb_3Sn irradiated with fast protons. *Bulletin of the Lebedev Physics Institute* **44**, 118–121 (2017). URL **https://doi.org/10.3103/S1068335617040078**.

[12] Lunev, A., Kuksin, A. & Starikov, S. Glide mobility of the 1/2[110](001) edge dislocation in UO_2 from molecular dynamics simulation. *International Journal of Plasticity* **89**, 85 – 95 (2017). URL **https://doi.org/10.1016/j.ijplas.2016.11.004**.

[13] Baranov, V. G., Lunev, A. V., Mikhalchik, V. V., Tenishev, A. V. & Shornikov, D. P. High temperature behavior of simulated mixed nitrides. *IOP Conference Series: Materials Science and Engineering* **130**, 012022 (2016). URL **10.1088/1757-899x/130/1/012022**.

[14] Lunev, A., Mikhalchik, V., Tenishev, A. & Baranov, V. Kinetic and microstructural studies of thermal decomposition in uranium mononitride compacts subjected to heating in high-purity helium. *Journal of Nuclear Materials* **475**, 266 – 273 (2016). URL **https://doi.org/10.1016/j.jnucmat.2016.04.018**.

[15] Baranov, V. *et al.* An attempt to reproduce high burn-up structure by ion irradiation of simfuel. *Journal of Nuclear Materials* **452**, 147 – 157 (2014). URL **https://doi.org/10.1016/j.jnucmat.2014.04.002**.

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[17] Lunev, A. V. & Tarasov, B. A. A classical molecular dynamics study of the correlation between the bredig transition and thermal conductivity of stoichiometric uranium dioxide. *Journal of Nuclear Materials* **415**, 217 – 221 (2011). URL **https://doi.org/10.1016/j.jnucmat.2011.06.009**.

[18] Baranov, V. G., Tenishev, A. V., Lunev, A. V., Pokrovskii, S. A. & Khlunov, A. V. A laser flash technique of measuring thermal diffusivity of nuclear materials at high temperatures. *Nuclear Physics and Engineering (in Russian)* **2**, 291 – 302 (2011).

Open-Source Projects

PULsE: Processing Unit for Laser Flash Experiments

2014 - 2021

https://kotik-coder.github.io/

PULsE is a software suite for processing data generated by a variety of laser flash analysis instruments. It is highly customisable and allows adjusting to the finest experimental detail, including but not limited to electromagnetic interferences, non-uniform laser heating and detection, and coupled radiative–conductive transfer. It offers noise-resilient mathematical optimisation capabilities for processing raw experimental data, where the search vector can include an arbitrary number of variables allowed by the model, and features a statistical toolkit for result validation.

Java | Numerical Modelling | Finite Difference Method | Discrete Ordinates Method | Numerical Optimisation

References

Christopher D. Hardie
STEP Materials Lead, UKAEA
@ chris.hardie@ukaea.uk
+44 (0)1235 464736

Alexander J. Knowles
Lecturer, University of Birmingham
@ a.j.knowles@bham.ac.uk
+44 (0) 121 414 3449

Martin Brunner
Head of R&D, Netzsch-Gerätebau
@ martin.brunner@netzsch.com
+49 9287 8810