

Jack A. Wilson, PhD

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Nuclear materials scientist and thermochemical engineer with expertise in experimental characterization, thermodynamic modeling, data analysis and process improvement within nuclear materials systems. Experienced leading reproducible data workflows, quality-focused research infrastructure, and integrated experimental/computational methods to support engineering decision-making. Strong background in cross-functional R&D, statistical analysis, scientific software development, and laboratory operations.

Authorized to work in the U.S.; no sponsorship required.

WORK EXPERIENCE

University of South Carolina

Post-doctoral Fellow

May 2023 – Present

Columbia, SC

- Lead thermodynamic assessments of molten-salt systems to support advanced nuclear reactor development and safety analyses through integration of experimental characterization and CALPHAD modeling.
- Co-developer of the ORNL/USC Molten Salt Database – Thermochemical (MSD–TC), leading implementation of version-control and release-management practices for auditable and reproducible database releases.
- Performed thermochemical characterization and handling of uranium-containing molten salts within radiological and inert-atmosphere laboratory environments.
- Developed cloud-hosted thermochemical data infrastructure and analysis tools to improve data quality, traceability, visualization, and producibility across collaborative research workflows.
- Supervised undergraduate researchers and coordinated collaborative experimental projects recognized at the DOE Molten Salt Reactor Workshop 2025.

Bangor University

Doctoral Researcher (Industry-Sponsored R&D)

Oct. 2019 – May 2023

Bangor, Wales

- Conducted industry-sponsored R&D with the UK National Nuclear Laboratory focused on high entropy alloy development for accident-tolerant nuclear fuel systems.
- Published peer-reviewed research and presented findings at international scientific conferences.
- Secured internal university funding to support an undergraduate summer research internship.
- Collaborated across a five-university EPSRC Centre for Doctoral Training involving Bangor, Bristol, Cambridge, Imperial College London, and the Open University.

University of Oxford

Visiting Researcher

Jun. 2019 – Aug. 2019

Oxford, England

- Conducted studies of oxygen-sensing mechanisms in algae and early land plants.
- Introduced nanoDSF into the group's workflow, resolving an experimental bottleneck and improving assay reliability resulting in a peer-reviewed publication.

Liquids Research Ltd.

Laboratory Technician

May 2018 – Sep 2018; May 2019 – Sep 2019

Bangor, Wales

- Produced ferrofluid and magnetorheological fluid formulations for rheometric and magnetic characterization.
- Supported industrial R&D activities operating under ISO9001-compliant documentation and data-recording procedures.
- Performed rheometry, viscometry, and vibrating sample magnetometry measurements for product evaluation and development.
- Contract extended based on technical performance and reliability.

Bangor University – School of Chemistry

Laboratory Technician

Jun. 2018 – Sep. 2018

Bangor, Wales

- Performed isolation, purification, and characterization of alkaloid natural products from *Narcissus* species using NMR spectroscopy and thin-layer/column chromatography.

EDUCATION

Bangor University

PhD, Nuclear Engineering and Science

Feb. 2023

Bangor, Wales

- Thesis: Compositionally complex alloys in accident tolerant fuel coating systems.

MChem Chemistry (First Class Honours)

Aug. 2019

TECHNICAL SKILLS

- Thermodynamic Modeling & Simulation: CALPHAD, FactSage
- Data Science & Statistical Analysis: R, regression modeling, uncertainty quantification, data visualization
- Experimental Techniques: DSC, TGA, XRD, SEM, XRF, PPMS, ICP-OES/MS, IGFA, AFM, LC/MS, NMR, FTIR, UV-Vis, profilometry, optical microscopy, optical dilatometry.
- Synthesis/manufacture techniques: magnetron sputtering coating deposition, arc melting, thermal treatments, wet chemistry
- Software & Data Infrastructure: R Shiny, Git/version control, reproducible data pipelines, database management, bash scripts
- Engineering & Quality Methods: root-cause analysis, experimental design, process optimization, statistical analysis, technical documentation

SELECTED PROJECTS

MOLTSA – Molten Salt Thermochemical Platform

- Developed R/Shiny platform for thermochemical data storage, visualization, and validation supporting CALPHAD workflows.
- Implemented FAIR-aligned data infrastructure and reproducible analysis pipelines.
- Deployed cloud-hosted application using AWS EC2 and nginx.

ALLOYS.ONE – High Entropy Alloy Thermophysical Properties Platform

- Developed tools to estimate thermophysical properties of compositionally complex and multi-principal component alloys

SELECTED PUBLICATIONS

J. A. Wilson *et al.* Thermodynamic properties of ZrCl_4 with LiCl , NaCl , KCl , CsCl , MgCl_2 , and UCl_3 for molten salt reactor applications. *J. Mol. Liq.* **437**, 128578 (2025).

J. A. Wilson *et al.* Thermodynamics and Phase Stability of SmF_3 with LiF , NaF , and KF for Molten Salt Reactor Applications. *ACS Omega* (2026) doi:10.1021/acsomega.6c01404.

J. A. Wilson *et al.* MOLTSA: An R Shiny Platform for Molten-Salt Thermochemical Data Management, Analysis, and Assessment. *J. Open Res. Softw.* **14**, (2026).

J. A. Wilson *et al.* Assessing the high concentration of vacancies in refractory high entropy alloys. *Materialia* **28**, 101764 (2023).

J. A. Wilson *et al.* Predicting the thermal expansion of body-centred cubic (BCC) high entropy alloys in the Mo–Nb–Ta–Ti–W system. *J. Phys. Energy* **4**, 034002 (2022).