

**Title:**  Thermal Modelling of Spent Fuel Drying

**Type of award**  PhD Research Studentship

**Department**  Mechanical Engineering, Fluid and Dynamics Research Group

**Scholarship Details**  Enhanced stipend up to £17,000 p.a. subject to eligibility criteria and award. The funding will also cover the amount of tuition fees associated with UK-based students

**Duration**  3.5 years

**Eligibility**  Home/EU/Overseas

**Start Date**  Available now

**PhD Topic Background/Description**

The UK has a substantial inventory of used nuclear fuel currently held under water in storage ponds. The owner of the fuel (the UK Nuclear Decommissioning Authority, NDA) wishes to ensure the reliability of the process of drying the fuel in preparation for eventual disposal.

The NDA has already invested in laboratory-scale R&D on fuel drying using non-radioactive simulant materials, and the purpose of this project is to develop a complementary modelling capability that can address open questions relating to evaporation under near-vacuum conditions. These questions lie at the blurred interface between statistical mechanics descriptions of the microphysics and macro-scale continuum models that will be of more direct utility for risk evaluation in practice.

All such continuum models make statistical assumptions about molecular behaviour, and this project will seek to test and refine these assumptions, using direct molecular simulation as a ground truth and seeking to build a self-consistent description across all scales of spatial and temporal averaging.

We seek to account for electrostatic considerations in the evaporation from surfaces and cracks in solid substrates, as well as mapping the deviation from the perfect gas model that is posed by near-vacuum conditions and by the multi-species, multi-phase nature of the problem at hand. Under conditions where traditional continuum descriptions become invalid, we must develop from first principles suitable replacements, and this activity will form the intellectual core of the PhD thesis.
This is an excellent opportunity to address abstract questions that will feed, within the scope of the project, to outcomes of direct practical utility, in collaboration with National Nuclear Laboratory (NNL) – a leading employer of graduate students in this field.

**Candidate Requirements**

Applicants must hold/achieve a minimum of a master’s degree (or international equivalent) in Physics, Engineering or Mathematical Sciences. Applicants without a master’s qualification may be considered on an exceptional basis, provided they hold a first-class undergraduate degree. Please note, acceptance will also depend on evidence of readiness to pursue a research degree.

If English is not your first language, you need to meet this profile level:

**Profile E**

Further information about [English language requirements and profile levels](#).

**Basic skills and knowledge required**

Interest in statistical mechanics, partial differential equations and in the intellectual exercise of systematic model development. Some prior experience in programming in a compiled language relevant to design of numerically intensive simulation is essential.

**Informal enquiries**

Please email Dr Andrew Lawrie ([Andrew.Lawrie@bristol.ac.uk](mailto:Andrew.Lawrie@bristol.ac.uk))

For general enquiries, please email [came-pgr-admissions@bristol.ac.uk](mailto:came-pgr-admissions@bristol.ac.uk)

**Application Details**

To apply for this studentship, submit a PhD application using our [online application system](http://www.bristol.ac.uk/pg-howtoapply)

Please ensure that in the Funding section you tick “I would like to be considered for a funding award from the Mechanical Engineering Department” and specify the title of the scholarship in the “other” box below with the name of the supervisor.

**Closing date for applications:** 25 June 2021

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