**Title:** Multi-scale Characterisation of Residual Stress in AGR Fuel Cladding

<table>
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<tr>
<th>Type of award</th>
<th>PhD Research Studentship</th>
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<tr>
<td>Department</td>
<td>Mechanical Engineering</td>
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<td>Scholarship</td>
<td>£18,000 p.a.</td>
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<tr>
<td>Duration</td>
<td>3.5 years</td>
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<td>Eligibility</td>
<td>Home / EU only</td>
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<td>Deadline</td>
<td>1 October 2019</td>
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**PhD Topic Background/Description**

Residual stresses in the stainless steel cladding of spent Advanced Gas-cooled Reactor (AGR) nuclear fuel elements affect their behaviour during storage. For example, in a fuel storage pond the cladding can experience a type of material degradation known as Inter-Granular Stress Corrosion Cracking (IGSCC) which is caused by a combination of stress and electrochemical action. To ensure that spent fuel elements can be stored safely, it is important to be able to measure stresses inside the cladding material and understand how they develop during manufacture, irradiation and storage. This includes stresses at the scale of a complete fuel element but also at much smaller scales: micro-scale residual stresses between adjacent crystallites of steel can also affect the material's behaviour.

Working in the Solid Mechanics group at the University of Bristol, you will develop specialised techniques for measuring stresses in AGR fuel cladding. These could include destructive methods which involve cutting specimens with Electrical Discharge Machining or a Focussed Ion Beam while measuring how they deform, or non-destructive techniques based on the scattering of X-rays and neutron radiation. The project will make use of Bristol’s dedicated labs for materials characterisation, residual stress analysis and electron microscopy, and will also access national facilities for radiation scattering when necessary.

Your work will allow the NNL and other researchers to investigate the mechanisms of internal stress development within AGR fuel. In the future, this will be used to provide better predictions about the integrity of fuel under storage and to determine better ways of storing spent nuclear fuel.

url for further information:
http://www.bristol.ac.uk/engineering/people/harry-e-coules/overview.html

**Candidate Requirements**

Applicants must hold/achieve a minimum of a master’s degree in Engineering, Materials Science (or international equivalent) in a relevant discipline.
Basic skills and knowledge required.
A good understanding of stress analysis and the structure and mechanics of materials is essential. Any experience with X-ray diffraction or electron microscopy would be desirable.

Scholarship Details
Scholarship covers full UK/EU (EU applicants who have been resident in the UK for 3 years prior to application) PhD tuition fees and a tax-free stipend of £18,000 subject to contracts and eligibility criteria. EU nationals resident in the EU may also apply but will qualify only for PhD tuition fees.

Informal enquiries
For informal enquiries, please email Dr Harry Coules, harry.coules@bristol.ac.uk

For general enquiries, please email came-pgr-admissions@bristol.ac.uk

Application Details
To apply for this studentship submit a PhD application using our online application system [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 Dr Harry Coules.

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