

**Imperial College London**  
**Department of Civil and Environmental Engineering**  
**EPSRC CDT in Sustainable Civil Engineering**

**PhD Studentship:**

**Ultra-high performance concrete for defence applications**

**Supervisors:** [Professor Chris Cheeseman](#), [Mr Andy Pullen](#), [Dr Robert Vollum](#), [Dr Hong Wong](#)

**Industry:** [Defence Science and Technology](#) (Dstl)

Ultra-high performance concrete (UHPC) is a high-strength and high-ductility construction material produced by blending Portland cement with fine reactive powders, fibres and other admixtures. It is increasingly used in conventional infrastructure and has huge potential to be developed as a novel blast resistant material for defence applications. However, there are a number of fundamental questions concerning its composition, processing and properties that need to be resolved to enable wider exploitation. The aim of this project is to address some of these questions to improve our scientific understanding in order to further develop and optimise UHPC for defence applications.

The research will: a) produce a range of UHPC by varying the mix constituents and proportions, processing and curing techniques; b) carry out detailed microstructure characterisation using quantitative microscopy and other analytical methods to study the reaction mechanism, hydrate assemblage and pore structure; c) assess the workability, mechanical properties (static/dynamic), impact resistance, volumetric stability and durability of the resultant UHPC; d) establish constitutive relationships and models to predict properties from composition and microstructure; and e) evaluate the potential of UHPC for defence applications.

We are seeking very capable and motivated PhD applicants to join our team to work on this exciting and highly innovative project. You will have the opportunity to collaborate with leading scientists and engineers from Imperial College London and Defence Science and Technology Laboratory. You will apply a range of advanced materials characterisation techniques available in our new Centre for Infrastructure Materials, to gain fundamental scientific understanding of the relationship between composition, processing and properties of UHPC. This will help establish guidelines to optimise design of UHPC. A successful outcome is the development of a new class of materials optimised for defence applications. This will contribute to enhancing the safety and resilience of UK critical infrastructure against various threats.

#### **Eligibility and Funding**

Funding is available for applicants with settled UK status (see <https://www.epsrc.ac.uk/skills/students/help/eligibility/> for eligibility). However, outstanding EU candidates will also be considered. The studentship offers a stipend of approximately £16,000 per annum (tax free) and covers fees at the UK/EU student rate for a period of four years.

Applicants for the studentship should have or expect to obtain a first or upper second class MSc/MEng in engineering (civil, mechanical etc.), materials science, physics or related disciplines. Some knowledge of cementitious materials and concrete technology would be advantageous but is not essential. You should be enthusiastic with good interpersonal and communication skills.

### **Contact**

If you are interested in this position, please email a CV and covering letter to Steve Hullock at [s.hullock@imperial.ac.uk](mailto:s.hullock@imperial.ac.uk).

For informal enquires and to request more information, contact Professor Chris Cheeseman (<http://www.imperial.ac.uk/people/c.cheeseman>)

This PhD studentship is co-funded by the EPSRC CDT in Sustainable Civil Engineering at Imperial College London:

(<http://www3.imperial.ac.uk/sustainablecivilengineering>)

### **Deadline**

Review of application is now in progress and will continue until a suitable candidate is identified. The starting date for this PhD Studentship is 1st of October, 2018.