

Environmental sustainability assessment to guide the development of cements produced from bauxite residue and other high-volume industrial by-products

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Applications are invited for a PhD scholarship funded by the European Commission under the Horizon 2020 – Research and Innovation Framework Programme, on the project titled “Industrial Residue Activation for Sustainable Cement Production (ReActiv)”. The PhD student will apply life cycle assessment to quantify the environmental performance of various novel technologies at lab and industrial scales to process bauxite residue (‘red mud’) and possibly other high-volume industrial by-products (e.g. copper slag) into raw materials that can be used in marketable cementitious products, e.g., clinker, cement, mortar, and concrete.

The PhD will be based in the Materials Section of the Department of Civil and Environmental Engineering, working closely with consortium partners, particularly the University of Tartu, Advanced Minerals and Recycling Industrial Solutions, Mytilineos, Aughinish Alumina, and LafargeHolcim. This PhD project offers a wide range of training and development opportunities in a highly stimulating environment, as well as access to internationally leading academics and industrial partners, research facilities, and networks.

Project details

The key aim of this PhD project is to assess the life cycle environmental impacts of various process technologies that transform bauxite residue into value added raw materials for cementitious material production, to support their development throughout the ReActiv project.

These cementitious products will contain 30 mass% or greater bauxite residue, and likely lead to significantly lower environmental impacts than comparable and conventional Portland cement products. The life cycle assessment results generated by the PhD student will thus be used to proactively guide the development of process technologies throughout the ReActiv project, which will be led by various academic and industrial partners across Europe. High-volume industrial by-products other than bauxite residue will also be included in the assessment, as appropriate. Another key aim of this PhD project is thus to evaluate the environmental performance of cementitious products containing mixtures of high-volume industrial by-products or materials derived from them, in high overall amounts, that may thus potentially lead to greater environmental benefit.

There will be various opportunities for this PhD student to meet and work with project partners, including short placements (e.g. 1-2 weeks in length) at European alumina and cement plants.

This PhD student will work aside another PhD student, also funded by the ReActiv project, who will aim to predict the chemistry and properties of cementitious binders incorporating bauxite residue and potentially other high-volume industrial by-products using thermodynamic modelling.

Academic requirements and experience

Required

- A good first class degree (or international equivalent) in a STEM subject, e.g., Physics, Applied Mathematics, Chemical Engineering, Environmental Science), or a course with an emphasis on applied, quantitative, and possibly computational methods, e.g. Economics.
- A masters level degree qualification in any course with an emphasis on applied, quantitative, and possibly quantitative methods, as indicated above, alone or in addition to an undergraduate level degree.
- Experience in Python and/or Matlab programming, and with life cycle assessment, or a keen interest to learn.
- Strong interest in sustainability and research.
- Excellent English communication skills.

How to apply

Applicants wishing to be considered for this opportunity should send the following application documents to Dr. Rupert J. Myers (r.myers@imperial.ac.uk):

1. Current CV including details of their academic record
2. Covering letter making explaining their motivation and suitability (1 page maximum)
3. Contact details of two academic referees

Application via the Imperial College Registry is not necessary at this stage.

Applications will be regularly reviewed until the position is filled.

Funding notes

The studentship will provide funding for 3.5 years including tuition fees and a tax-free stipend at the standard UKRI London rate, ~£17,285 for the 2020/21 academic year.

Full funding is available to Home and EU students. The funding can also be used to partly support an international student.