THE UNIVERSITY OF MANCHESTER

PARTICULARS OF APPOINTMENT

FACULTY OF SCIENCE & ENGINEERING

SCHOOL OF ENGINEERING

DEPARTMENT OF MECHANICAL, AEROSPACE AND CIVIL ENGINEERING

RESEARCH ASSOCIATE – CARBONATION TREATMENT OF WASTE MATERIALS

VACANCY REF: SAE-029224

Salary:	£37,174 - £45,413 per annum depending on experience
Hours:	Full time (1 FTE)
Duration:	Fixed term for 12 months
Location:	Oxford Road, Manchester

Enquiries about the vacancy, shortlisting and interviews:
Name: Cise Unluer
Email: cise.unluer@manchester.ac.uk

The School of Engineering has an opportunity for a Research Associate, working with Prof Cise Unluer, to make a leading contribution to ongoing projects involving the integration of industrial wastes and permanent storage of CO2 in construction materials, with the goal of contributing towards decarbonising concrete.

The primary aim of this research project is to develop and maximise the sustainability potential of a range of carbon-neutral construction products through the incorporation of novel cementitious binders and locally available waste materials with the ability to absorb CO2 while gaining high strength and durability.

Overall Purpose of the Job:

The Research Associate (RA) will look into different waste materials and industrial by-products available in the UK with the potential to be used as cement and aggregate replacements, and design different treatment options for each, focused around their participation in hydration and carbonation reactions. This will involve analysing the reaction mechanisms and phase formations under different conditions (including the quantification of different crystalline and amorphous phases via various methods) and using this information to optimise treatment

options and subsequent mix designs, where these wastes will be used as cement/aggregate replacements. Further analysis will involve mechanical and durability assessment and detailed microstructural analyses.

This is a fantastic opportunity for someone looking for a challenging and varied construction materials role. The RA will work with latest state-of-the-art processes of preparing and characterising a range of cementitious materials.

This role will offer the unique opportunity of working directly with industrial partners and international collaborators to successfully deliver the project's objectives.

The successful candidate will also be expected to contribute to the formulation and submission of research publications and research proposals as well as managing and directing complex and challenging projects as opportunities allow.

Key Responsibilities, Accountabilities, Duties:

The duties of the position will include:

- Plan, review and execute research and development activities.
- Manage the resources allocated to the project, including supervising the dedicated technician and liaison with other research staff.
- Prepare and deliver technical reports and journal papers.
- Represent at project meetings in the UK and overseas.
- Manage dissemination activities within a project.
- Manage intellectual property and exploitable results and future collaboration arising from a project.
- Produce prototype materials processes and parts.
- Test, characterise and validate new composite materials.
- Use research resources, laboratories and workshops as appropriate.
- Plan and manage own research activity in collaboration with others.
- Deliver training to research students attached to the project

Person Specification

Essential Knowledge, Skills and Experience:

- Have, or be about to obtain, a PhD or equivalent in civil engineering or materials science, with good knowledge and understanding of mechanical performance and microstructural development of cementitious composites.
- Knowledge of cementitious formulations with alternative binder systems and wastes/by-products used in concrete products, mechanisms behind hydration and carbonation reactions, associated phase formations, and how these reactions are affected by various additives.
- Ability to identify and quantify different hydrate and carbonate phases in cementitious mixes.
- Ability to design/prepare various cementitious composites.
- Ability to assess the mechanical and physical properties of cementitious composites.
- Ability to perform image analysis and evaluate data of internal structures.
- Previous experience in chemical, mineralogical and microstructural characterisation (XRD, TGA, FTIR and SEM-EDX).

- Ability to prepare and supervise full-scale tests on larger structural units.
- At least 3 published papers as first/leading or corresponding author in top journals such as Cement and Concrete Research or Cement and Concrete Composites

Desirable skills and experience

- Excellent communication and interpersonal skills
- Excellent time management and organisational skills
- Ability to work independently and as part of a team
- Ability to liaise confidently and effectively with a range of individuals
- Flexible approach to dealing with research problems as they arise
- Ability to present in both written and oral publications
- Ability to meet deadlines
- Ability to contribute to broader management and administrative processes.
- Ability to assess and organise resources

About the School of Engineering

The School of Engineering is one of two large, multi-disciplinary Schools within the Faculty of Science and Engineering, the other being the School of Natural Sciences. The Schools operate alongside the Faculty's research institutes including: Manchester Institute for Biotechnology, Dalton Nuclear Institute and Photon Science Institute, Thomas Ashton Institute and Manchester Environmental Research Institute. The School is made up of four academic departments; Chemical Engineering & Analytical Sciences, Computer Science, Electrical & Electronic Engineering and Mechanical, Aerospace & Civil Engineering. The School hosts over five thousand undergraduate and postgraduate students across seven academic teaching disciplines including engineering project management. Our interdisciplinary research spans multiple themes including, robotics, nuclear, bioengineering, modelling, virtual engineering and resilient systems and is enabled by our world-class facilities and technical support. Social responsibility is at the centre of everything we do within the School whether that is our teaching and learning incorporating the UNs sustainable development goals, our research addressing societal grand challenges such as plastic usage, climate change or the ageing population as well as our commitment to supporting our students, staff and communities.

About the Department of Civil Engineering & Management

The Department of Civil Engineering & Management, previously known as Mechanical, Aerospace and Civil Engineering, was formed in 2004 from the Mechanical Aerospace and Manufacturing Department of UMIST, the Manchester School of Engineering at the Victoria University of Manchester and the Manchester Centre for Civil and Construction Engineering at UMIST. Our School has a rich heritage and a tradition of excellence in research and teaching. We have over 100 members of academic staff in the department supported by dedicated administration and technical support groups. The Department of Mechanical Aerospace and Civil Engineering is one the largest engineering schools in Europe, comprising over 1000 undergraduates, over 800 taught postgraduate students and over 250 postgraduate research students. Research projects in the department are wide-ranging, and include theoretical and computational research, experimental studies, resilient systems, design and management. Our work is applicable to diverse industry sectors and interests, for example: aerospace, manufacturing, civil, process industries, medical, Nano-engineering, energy, environment,

transport and nuclear. The 2014 Research Assessment Exercise reflects the strength of the research in MACE, where 100% of our impact on industry and policy was ranked as world leading or internationally excellent. The Department has a strong links with industry and international collaborations with European, Asian, North and South American research groups. More information can be found at: https://www.mace.manchester.ac.uk/