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****Please read accompanying guidance notes****

Department	School of Engineering and the Built Environment
Supervisors	Prof. Islam Shyha, Dr Zhilun Lu, Dr Dongyang Sun, Dr Mark Dorris
Funding Status	Funded PhD Project (Worldwide)
Application Deadline	14/04/2022
Project Title	Developing Multifunctional Composite Materials for Sustainable Energy Applications

PROJECT DESCRIPTION

The development of sustainable energy must be accelerated in light of the deteriorating situation of the environment and climate. Sustainable energy development generally entails the promotion of renewable energy, reduced environmental risk, and high process optimization [1]. Furthermore, greener, more affordable, and scalable energy production and storage technologies must be developed, which should rely on earth-abundant and recyclable multifunctional materials with excellent performance [2].

In this project, we aim to develop sustainable multifunctional composite materials, with a particular focus on ceramics and composites reinforced with oxides, nanofibers, and nanocellulose, that can be used in a wide variety of energy harvesting and storage applications, such as energy storage capacitors, piezoelectric transducers, batteries, and thermoelectric converters.

The ideal candidate would be familiar with CAD design software such as SolidWorks as well as simulation tools such as ANSYS workbench. For the characterisation and testing of the developed materials, a background in SEM, X-ray diffraction (XRD), thermogravimetric analysis (TGA), differential scanning calorimetry (DSC), and Fourier transform infrared spectroscopy (FTIR) is expected. It would also help if you would be familiar with strain sensors and piezoelectric mats.

Academic qualifications

A first degree (at least a 2.1) ideally in Materials or Manufacturing Engineering or closely related area with a good fundamental knowledge of Materials Science or Chemistry.

English language requirement

IELTS score must be at least 6.5 (with not less than 6.0 in each of the four components). Other, equivalent qualifications will be accepted. Full details of the University's policy are available online.

Essential attributes:

- Experience of fundamental ceramic or composite materials fabrication or property characterisation
- Competent in basic materials laboratory skills
- Knowledge of Materials Engineering or Chemistry
- Good written and oral communication skills
- Strong motivation, with evidence of independent research skills relevant to the project
- Good time management

Desirable attributes:

Postgraduate training in Materials Engineering.

Indicative Bibliography	[1] A. Darmawan, et al., Integrated ammonia production from the empty fruit bunch. Innovative Energy Conversion from Biomass Waste 2022, 149-185.

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	[2] V. Dusastre and L. Martiradonna, Materials for sustainable energy. Nature Materials 2017, 15.
Funding notes	This project may be funded by a scholarship of the School of Engineering and Built and Environment. Please see School-funded PhD scholarships - RESEARCH AND INNOVATION (napier.ac.uk) for information on the scholarships and how to apply for them.
Enquiries	For informal enquiries about this PhD project, please contact Dr Zhilun Lu Z.Lu@Napier.ac.uk or Prof. Islam Shyha at i.shyha@napier.ac.uk at
Web page	https://www.napier.ac.uk/research-and-innovation/research-degrees/application-process

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