PhD Advert Template

Project title: Integrating 2D Materials into 1D Systems for Wearable Applications

Project ID *(optional)*:

Accept all year-round applications

Funding information: Self-funded students only

Project description:

The ever-evolving advances in nanoscale materials has led to the development of a family of atomically thin materials (*i.e.*, 2D materials) that offer unprecedented electrical, electronic, and electrochemical properties. Notably, a recently discovered class of 2D materials called “MXenes” has shown an excellent electrical conductivity and exceptional ability to store energy while being processible in solution – unlike common conducting materials like metals.[1] This unique combination of properties has opened doors to the development of novel 1D systems (*i.e.*, fibres and yarns) that could be integrated into everyday clothes to enable new functionalities such as harvesting energy from the wearer’s movements or tracking the physical and physiological activities of the wearer.[2-6] The estimated surge in the global market for wearable gadgets from US$37.1 billion in 2020 to US$104.4 billion by 2027 indicates an apparent market opportunity for new types of wearable systems that offer novel functionalities.[7]

This project aims to develop innovative solution-based processing approaches to effectively integrate 2D materials like MXenes into highly functional 1D systems with comparable mechanical properties and wearability to conventional clothing fibres. When seamlessly integrated into textiles, novel smart garments could be achieved which could be worn like everyday clothes while offering some of the functionalities of the current wearable electronic gadgets (*e.g.*, heart rate monitoring and activity tracking), leading to a major step change in wearable electronics.

During your PhD journey, you will work with a wide range of 2D materials including MXenes and gain practical skills that will enable you to drive forward innovation in designing the next-generation wearable electronic systems using the 21st century materials. You will join a close-knit research team of [Digital Materials Manufacturing](http://www.digim2.com) at Newcastle University (UK) and will be guided throughout your project.

If you are passionate about making new discoveries in the field of 2D materials to shape the future of wearable electronics, we invite you to apply for this exciting PhD programme. Please contact Dr Shayan Seyedin by email (shayan.seyedin@newcastle.ac.uk) if you wish to discuss the project and the application process.

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References:

[1] *Adv. Mater.* 32, 2001093, 2020.

[2] *Adv. Funct. Mater.* 30, 1910504, 2020.

[3] *ACS Cent. Sci.* 6, 254, 2020.

[4] *Adv. Funct. Mater.* 29, 1905015, 2019.

[5] *Small* 14, 1802225, 2018.

[6] *J. Mater. Chem. A* 5, 24076, 2017.

[7] Wearable Technology, *Grand View Research*, 2020.

Application enquires:

Dr Shayan Seyedin, Senior Lecturer in Chemical Engineering

<https://www.ncl.ac.uk/engineering/staff/profile/shayanseyedin.html>

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[ ]  agricultural technology

[ ]  arable farming

[ ]  livestock farming

[ ]  forestry & arboriculture

[ ]  other

Anthropology

[ ]  biological anthropology

[ ]  social anthropology

[ ]  other

Architecture, Building & Planning

[ ]  architecture

[ ]  built environment

[ ]  construction management

[ ]  landscape architecture

[ ]  rural planning

[ ]  surveying

[ ]  urban planning

[ ]  other

Biological Sciences

[ ]  bacteriology

[ ]  behavioural biology

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[ ]  biodiversity

[ ]  bioinformatics

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[ ]  biotechnology

[ ]  cancer biology

[ ]  cell biology

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Business & Management

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Communication & Media Studies

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Computer Science

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Economics

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Education

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Environmental Sciences

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Finance

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Food Sciences

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Forensic and Archaeological Sciences

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Geography

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Geology

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History & Archaeology

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Information Services

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Languages, Literature & Culture

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Law

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Linguistics & Classics

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Materials Science

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Mathematics

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Nursing & Health

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