

# Functional materials and devices for energy, sensing and biomedical applications

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Functional materials are promising candidates for energy harvesting and sensing applications. My research involves understanding structure-property and functionality relationships in novel polymer-based piezoelectric, ferroelectric and thermoelectric nanostructures, with a focus on the role of phase, crystallinity and morphology on their energy harvesting performance.

At the same time, these nanomaterials can be integrated into functional sensing devices using advanced microscale additive manufacturing techniques to create a range of flexible and stretchable sensors, including those aimed at biomedical or clinical applications. For example, a combination of aerosol-jet printing and 3d printing can be used to fabricate both bio-piezoelectric interfaces for sensing and stimulation of cells, as well as functionalised conformable microfluidic force sensors for precision joint replacement surgery. The ability to control properties at the nanoscale through processing therefore allows for subsequent integration into functional devices through additive manufacturing.

Prof. Kar Narayan received the Royal Society of Chemistry Peter Day Prize in 2023. She was recognised as one of the Top 50 Women in Engineering of 2021 by the Women's Engineering Society, and was elected Fellow of the Institute of Materials, Minerals & Mining (IoM3) in 2022. She was awarded the Armourers & Braisiers' Venture Prize Award in 2022, and the Institute of Physics Lee Lucas Award in 2023.

Presented by: **Julia Herrero Albillos**

Associate Professor of Materials Science and Metallurgical Engineering, and INMA researcher

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