

2531cs1108

When next-generation ion beams meet materials

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ProjectID	2531cs1108
Project title	When next-generation ion beams meet materials
EPSRC theme	Manufacturing The Future
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Host faculty and host department	Mathematical and Physical Sciences (MAPS) London Centre for Nanotechnology (LCN)
Lead department website	https://www.ucl.ac.uk/mathematical-physical-sciences/london-nano
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Standard or collaborative project	Standard project
Restrictions for candidates applying	Only Home fees candidates can apply

Project summary

Why this research is important? Ion beams are used for material removal (etching) in semiconductor chip fabrication, and they are a crucial technology in this time of unprecedented demand for computing power. Ionic liquid ion sources (ILIS) are an emerging technology that generate beams of atomic and molecular ions from non-volatile ionic liquids, giving access to new chemistries for materials processing. Previous work in our group has shown that these beams can efficiently etch semiconductor substrates, including silicon. To develop ILIS into useful tools for materials processing, we need a deeper understanding of how these novel beams interact with different materials. Key questions remain about how material removal and modification depend on ion dose, energy, incidence angle, ion chemistry, and target material.

Who will you be working with? With Dr Carla Perez-Martinez in the London Centre for Nanotechnology (<https://carlaperezmartinez.github.io>)

What you will be doing? You will use ILIS beams to investigate how materials are removed and modified under ion irradiation. You will carry out experiments in our vacuum facilities, comparing different target materials and ion chemistries and systematically varying parameters such as total dose, ion energy, and angle of incidence. You will learn to fabricate and operate the ion sources and to characterise the beam using time of flight and energy analysis. You will also work with ion optics for filtering and focusing the beam. You will use materials characterization techniques (e.g. profilometry, atomic and electron microscopy, and surface chemical analysis) to measure sputtering and chemical surface modification. As the project develops, there will also be scope to investigate implantation and subsurface modification.

Who are we looking for?

Suitable candidates will have a minimum of an upper second-class UK Master's degree in physics, electrical or electronic engineering, materials science, or a related discipline, or an equivalent overseas qualification.