

Design and fabrication of a vacuum stage

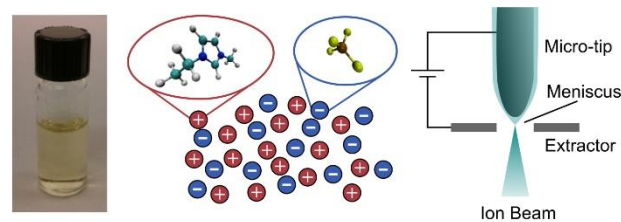
Supervisor: Dr Carla Perez-Martinez and Dr Aydin Sabouri

Project Overview

Ionic Liquid Ion Sources (ILIS) are electrospray devices that produce ion beams by means of field evaporation from ionic liquids. **Ionic liquids** are room temperature molten salts. The cations are usually large organic molecules, while the anions may be complex organic or simple inorganic ions.

In ILIS, a **needle emitter is covered with ionic liquid** and biased to a high voltage with respect to a downstream metallic extractor. The electric field causes the liquid to form a sharp meniscus. At the apex of the meniscus, the electric field triggers emission of ions from the liquid.

ILIS could be used **to produce exotic ions for material treatment**; for example, reactive ions for faster silicon etching compared to physical etching in microelectronics fabrication.



An ionic liquid, 1-ethyl-3-methylimidazolium tetrafluoroborate, and ILIS schematic

Planned Outcomes

Emission of ILIS takes place in a vacuum chamber. It is necessary to move different measurement instruments or irradiation targets within the chamber without breaking the vacuum, and so a motorised translation stage is required for this. The goal of this project is to design and construct a motorised stage, considering the constraints of operation in vacuum. The student will program software to control the stage and measure its displacement. If access to the labs is restricted, the project will shift focus towards the programming and control aspects.

Workplan

Weeks 1-2: Literature Review and familiarisation with Solidworks and programming software

Weeks 2-3: Design of motorised stage

Weeks 4-7: Construction of stage, implementation of control software

Week 8: Report preparation