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Surface modification using slow highly charged ions

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Slow highly charged ions deposit large amounts of their potential energy within the very first monolayers of a material. Depending on material properties, relaxation processes can also lead to permanent nanosized material modifications, e.g. hillocks and craters on surfaces of bulk samples - often in a similar manner as after swift heavy ion impact.
The type of created defect might vary even for a particular material as a function of kinetic and potential ion energy. For CaF2 crystals, for example, two thresholds could already be discovered: only if the projectiles' potential energy exceeds these thresholds, etch-pits and hillocks could be identified post-irradiation, respectively. However, studies so far were mainly limited to potential energies of several tens of keV, as the production of higher charge states together with low kinetic energies and high ion fluences becomes complex. This raises the question whether there are even more types of nanostructures besides the two mentioned above that have not been identified yet. Here, HITRAP offers the optimal possibility to bridge this gap and to expand the studies of highly charged ion induced nanostructuring.
In this contribution I will recap material modification studies using highly charged ions that were performed in the past to outline how HITRAP will help us explore an uncharted territory well beyond the state-of-the-art.

Primary author: NIGGAS, Anna (TU Wien, Institute of Applied Physics)

Co-authors: AUMAYR, Friedrich (TU Wien, Institute of Applied Physics); WILHELM, Richard A. (TU Wien, Institute of Applied Physics)

Presenter: NIGGAS, Anna (TU Wien, Institute of Applied Physics)

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