Heavy ion induced desorption measurements on cryogenic targets

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Abstract

Heavy-ion impact induced gas desorption is the key process that drives beam intensity limiting dynamic vacuum losses. Minimizing this effect, by providing low desorption yield surfaces, is an important issue for maintaining a stable ultra-high vacuum during operation with medium charge state heavy ions. For room temperature targets, investigation shows a scaling of the desorption yield with the beam’s near-surface electronic energy loss, i.e. a decrease with increasing energy. An optimized material for a room temperature ion-catcher has been found. But for the planned superconducting heavy-ion synchrotron SIS100 at the FAIR accelerator complex, the ion catcher system has to work in a cryogenic environment. Desorption measurements with the prototype cryocatcher for SIS100 showed an unexpected energy scaling, which needs to be explained. Understanding this scaling might lead to a better suited choice of material, resulting in a lower desorption yield. An experimental setup for systematic examination of this scaling is presented. The cryogenic beam-induced desorption yield of several materials at different temperatures is examined.

Figure 3: A typical measurement of the pressure evolution in the target region after beam impact. The desorption peak at the beginning is clearly visible. The thin red line constitutes the background fit, the bold green line shows height and position of the desorption peak. Only data points on the blue line have been used for calculating the background polynomial.