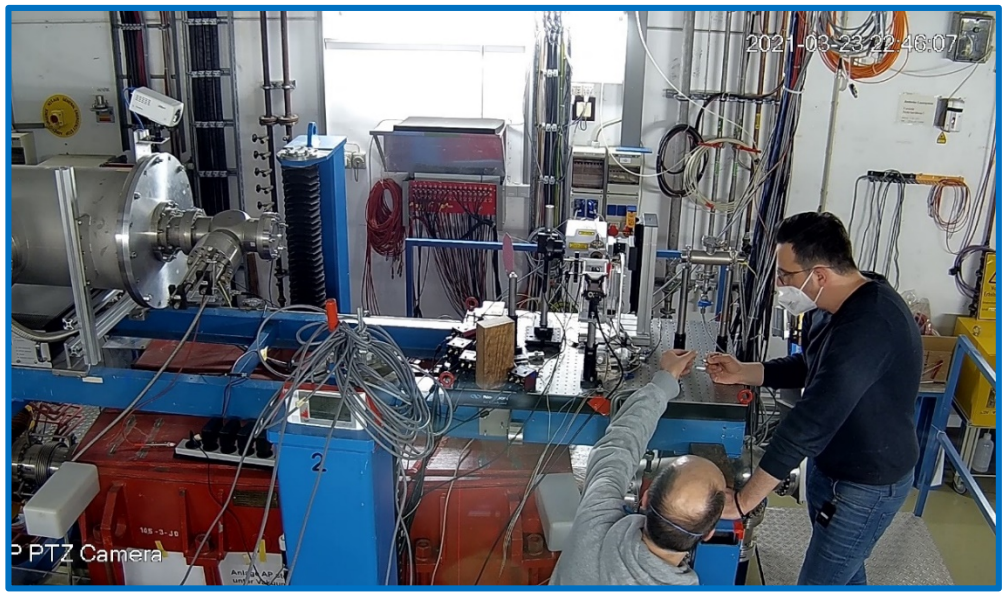
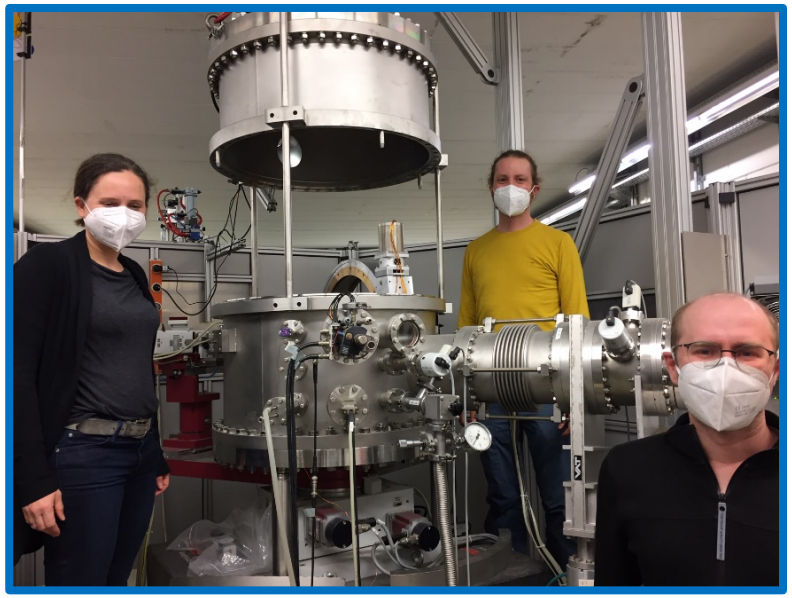
Status Report Material Science

CRYRING

SIS18 (Cave A)



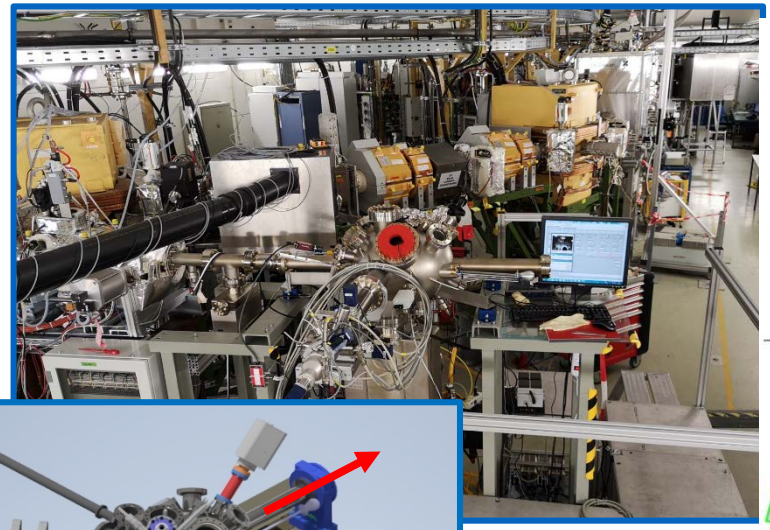
UNILAC (M-branch & X0)

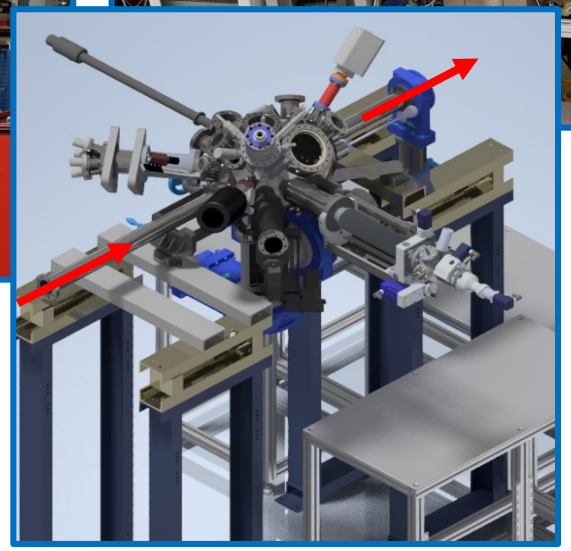


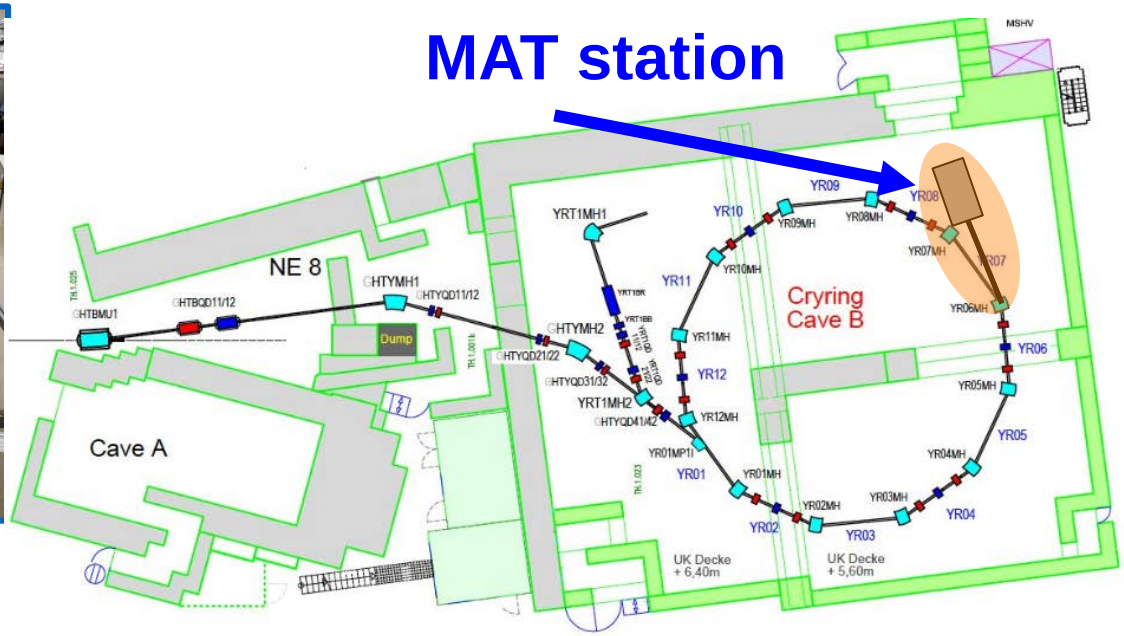
Granted beamtime for 2021/2022: 143 shifts at UNILAC, 31 shifts at SIS-18, 25 shifts at CRYRING

beamtime 2021: ~85% of planned experiments successfully realized
beamtime 2022: in preparation

MAT station at CRYRING







Verbundforschungsprojekt

- UHV irradiation chamber combined with in situ analysis
- Manipulator for precise sample positioning
- heating, cooling stage

AG SCHLEBERGER

M. Schleberger, L. Breuer

UNIVERSITÄT DUISBURG ESSEN

Offen im Denken

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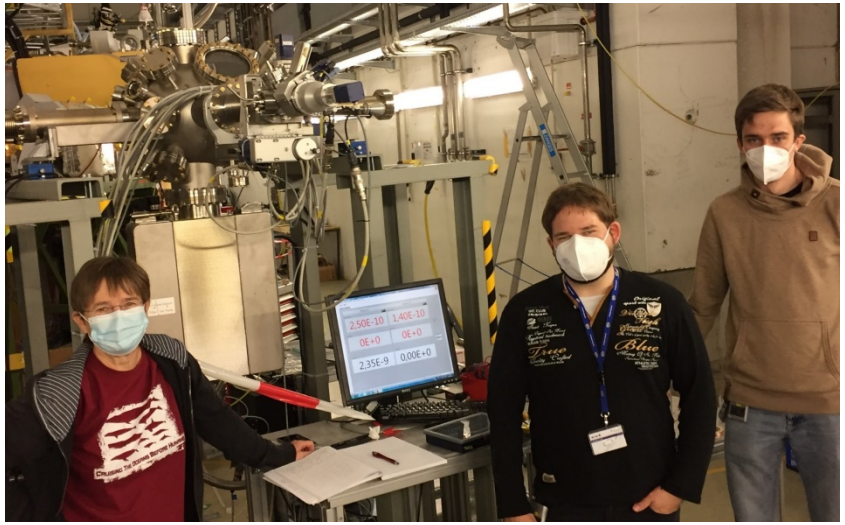
MAT station at CRYRING

UNILAC → SIS-18 → ESR → CRYRING → extraction MAT beamline

Beamtime 2021: Commissioning and first experiment

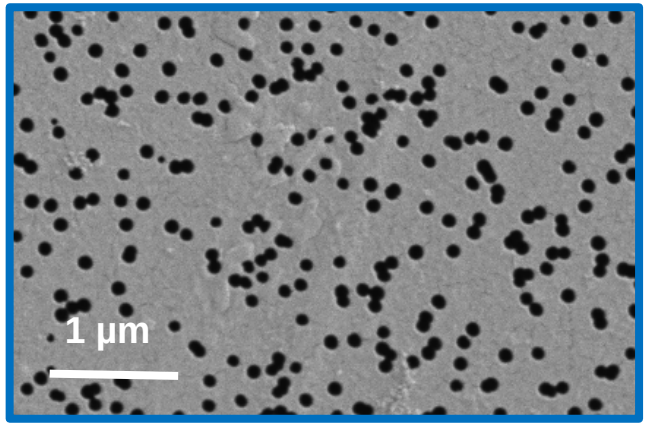


UHV chamber for irradiation and analysis

First beam in UHV chamber

$^{107}Ag^{47+}$ @ 5.9 MeV/u
3 x 10^5 ions cm^{-2} s^{-1}

extraction: 54% transmission



Quantification of extracted beam by track-etching of irradiated polymer foil

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MAT station at CRYRING

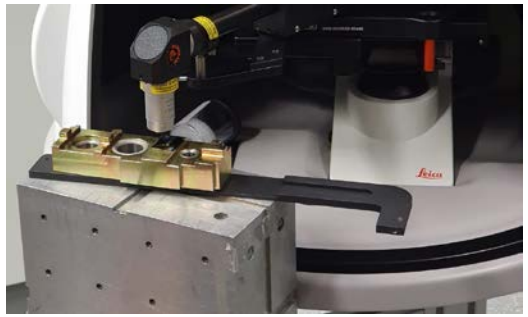
Beamtime 2022: irradiation of different materials (e.g. 2D samples) gas desorption experiments

experimental plans:

- installation of mass spectrometers for quantification of desorbed material
- installation of in-situ Raman analysis system

technical goal:

- higher beam intensities needed



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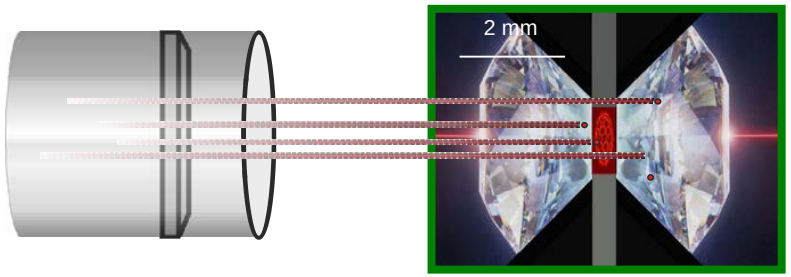
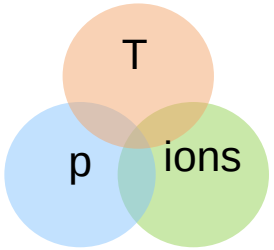
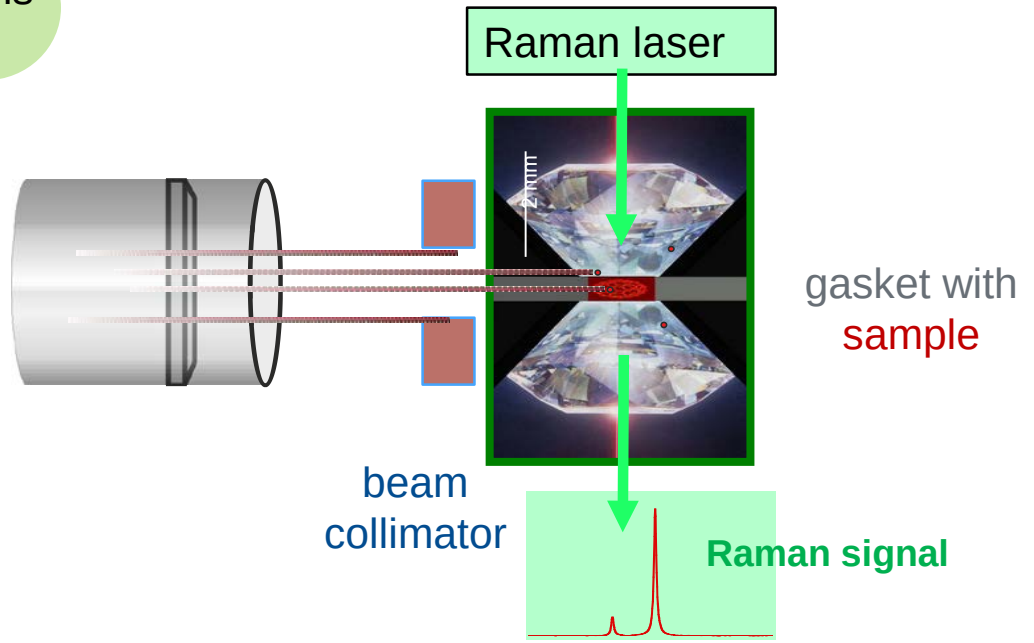
Materials under extreme conditions

5 days beamtime in Cave A





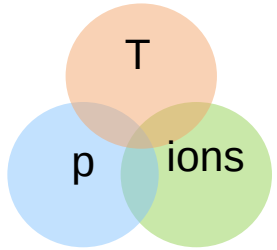
High-pressure irradiations combined with in-situ Raman spectroscopy



Materials under extreme conditions

next beamtime in Cave A

- remote-control goniometer stage for ion beam collimator (<1 mm)
- goniometer stage to align anvil cell and hit 100 µm sample
- stage to align Raman laser (µm) and analyze irradiated sample



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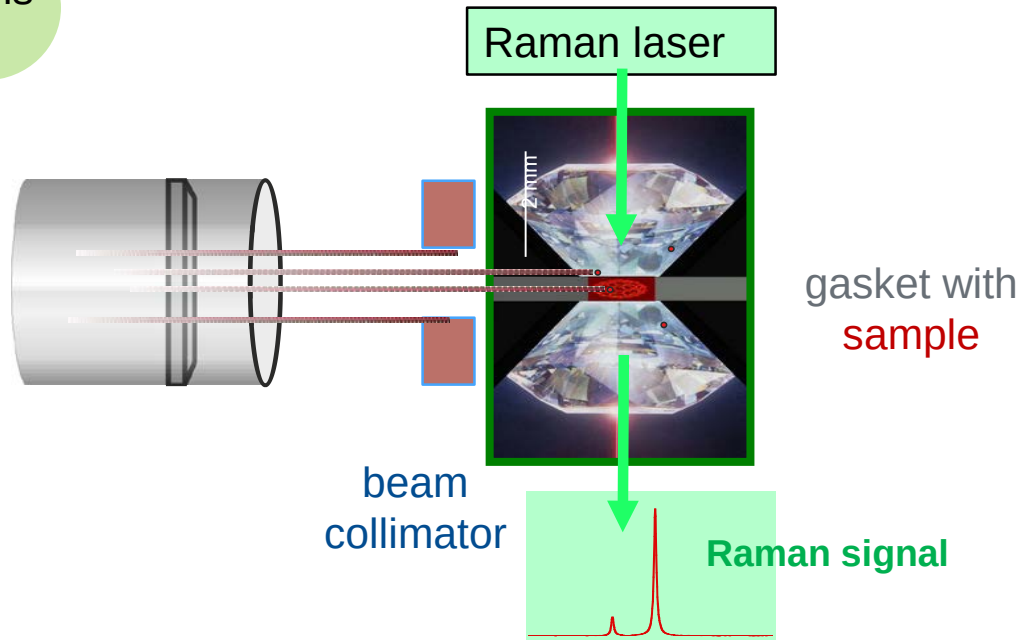

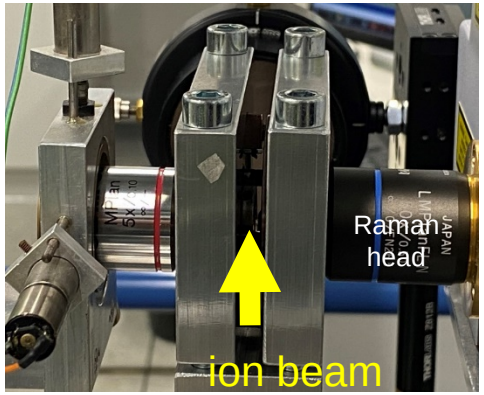

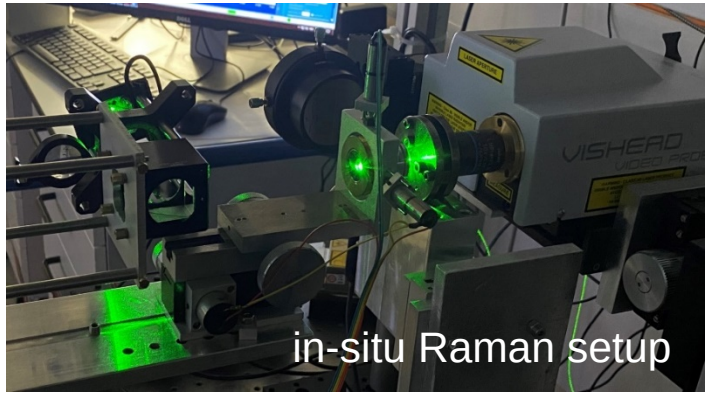

5 Verbundforschung Proposals 2022-2025

submitted 11/2021

Univ. Frankfurt: Prof. B. Winkler core invest

APPA cave

Construction and operation of an end-station at the BIOMAT beamline in the APPA cave for the irradiation of samples at very high static pressures

Univ. Heidelberg: Prof. L. Tajcmanova + Dr. S. Cionoiu and Prof. U.A.Glasmacher

APPA cave

Construction of experimental settings for the transformation of condensed matter under extreme conditions (P, T) by means of accelerated heavy ions

Univ. Duisburg/Essen: Prof. M. Schleberger + Dr. L. Breuer

CRYRING

Advanced Spectroscopy with Swift Heavy and Highly Charged Ions
TP1: Advanced Spectroscopic Characterization of Heavy-ion Induced Defects in Two-dimensional Solids
TP 2: Advanced Mass Spectrometry with Swift Heavy and Highly Charged Ion Projectiles

UNILAC

Univ. Giessen: Prof.M. Dürr

Ion-induced modifications in organic and biomolecular samples – from the fundamental excitation processes studied by means of mass spectrometry to controlled chemical modifications

Univ. Jena: Prof. C. Ronning + Dr. M. Hafermann

Simultaneous optical and electrical characterization of (phase-change) materials upon swift heavy ion irradiation

Thank you