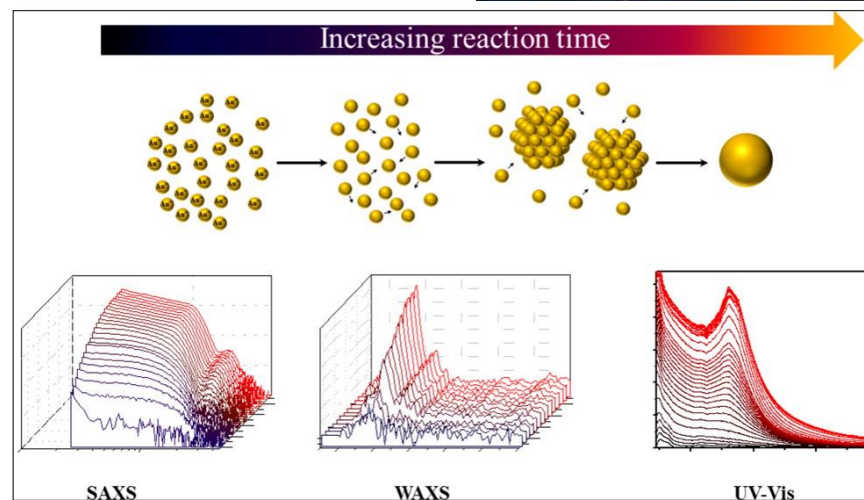
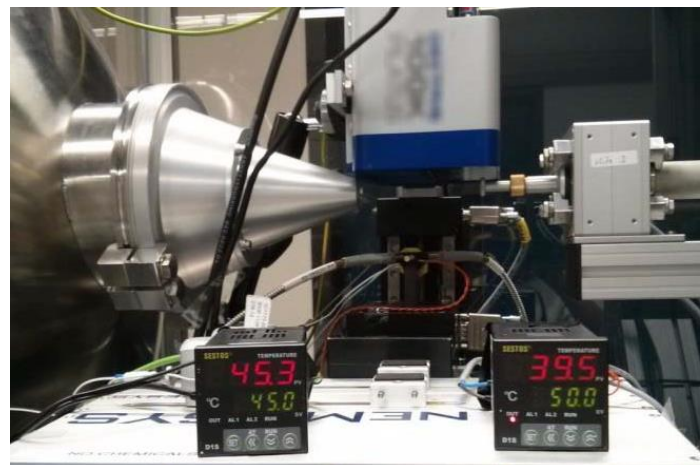
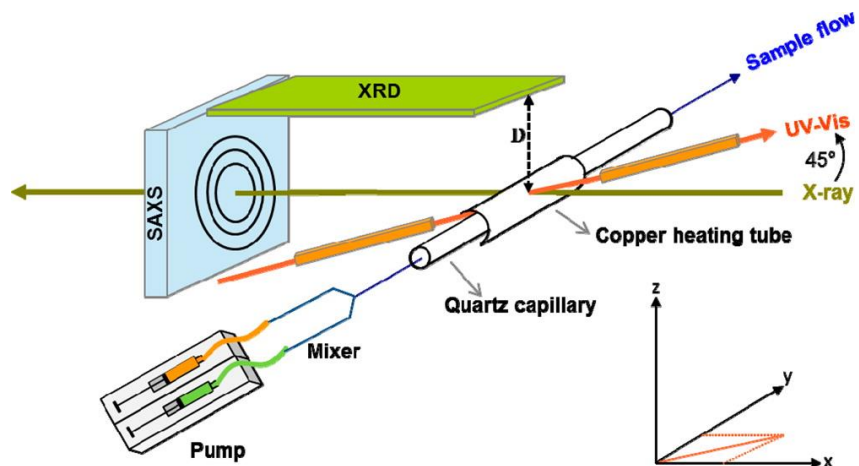
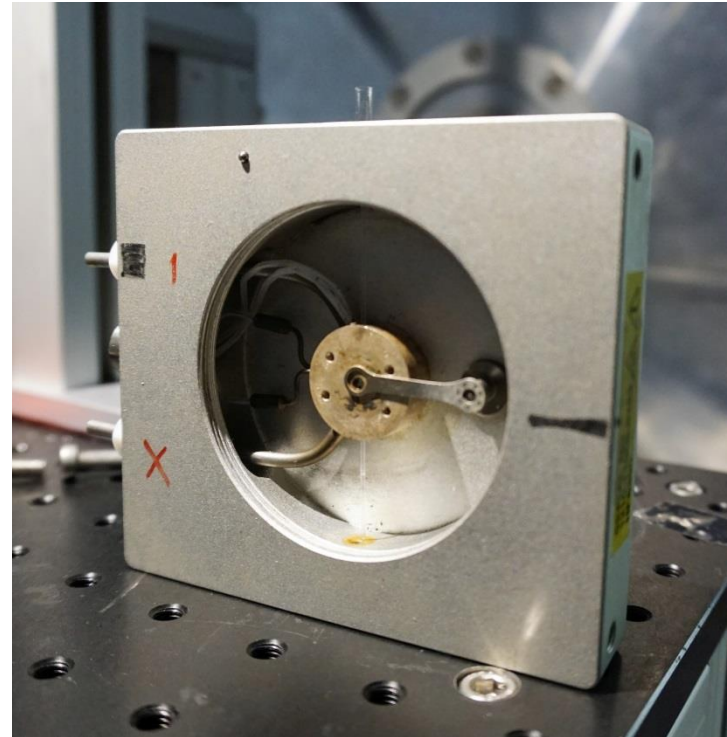
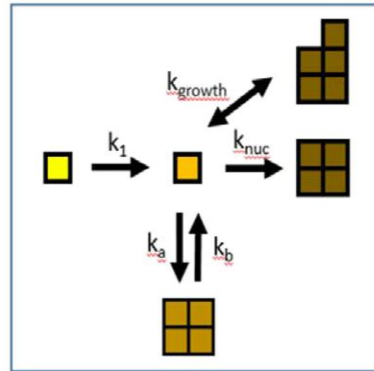
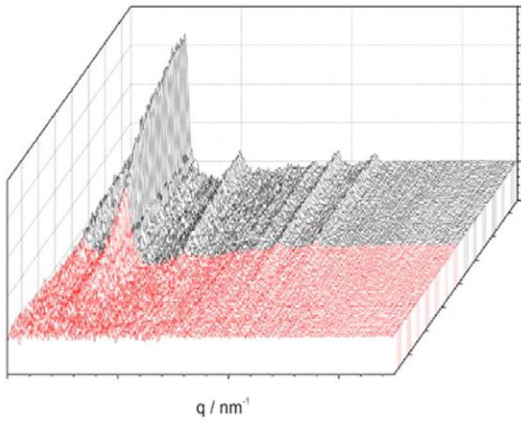


- 3D Printed capillary holder for simultaneous SAXS, WAXS and UV-VIS



- Linkam HT-600 (-190°C-600°C) -10 to 350°C tested

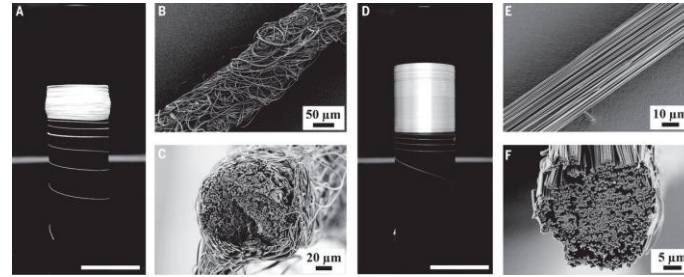
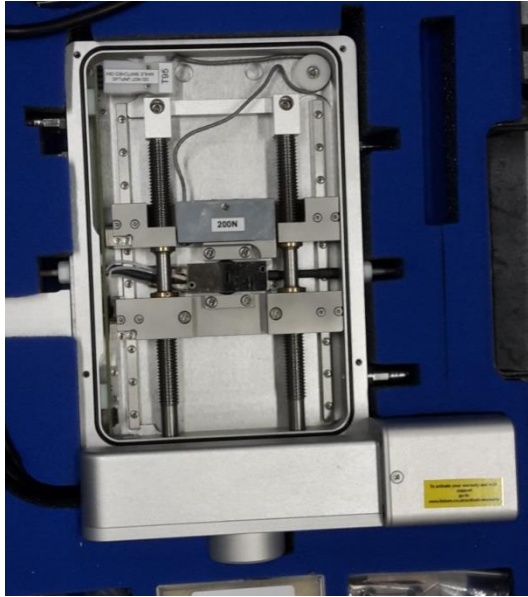
Glass capillaries (1mm vertical) for liquid and round metal cells for pastes or solids



[Nanoparticle Heat-Up Synthesis: \*In Situ\* X-ray Diffraction and Extension from Classical to Nonclassical Nucleation and Growth Theory](#) V Leffler, S Ehlert, B Förster, M Dulle, S Förster  
ACS nano 15 (1), 840-856

## • Tensile stage TST350

Mostly used for fibres but also rubber like materials

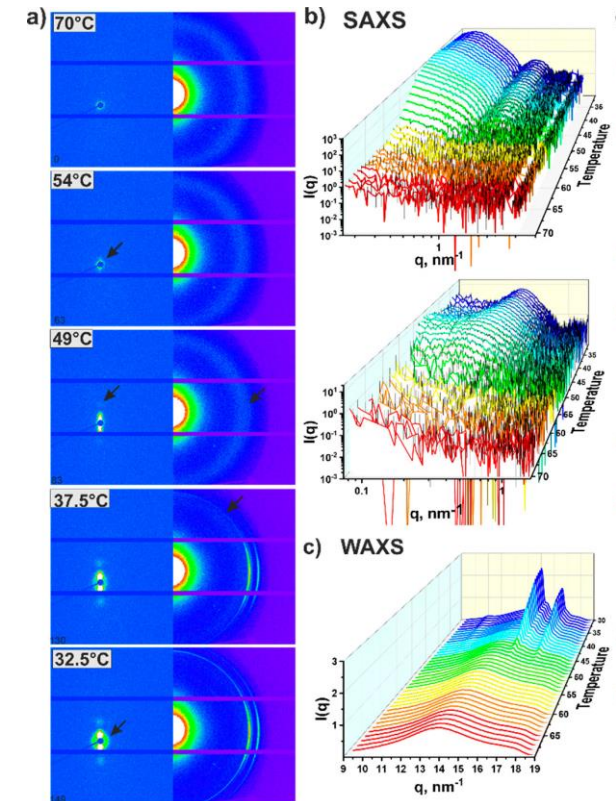


**High strength in combination with high toughness in robust and sustainable polymeric materials**

Xiaojian Liao, Martin Dulle, Juliana Martins de Souza e Silva, Ralf B. Wehrspohn, Seema Agarwal, Stephan Förster, Haoqing Hou, Paul Smith, Andreas Greiner

*Science*, 2019, 1376-1379 [DOI: 10.1126/science.aay9033](https://doi.org/10.1126/science.aay9033)

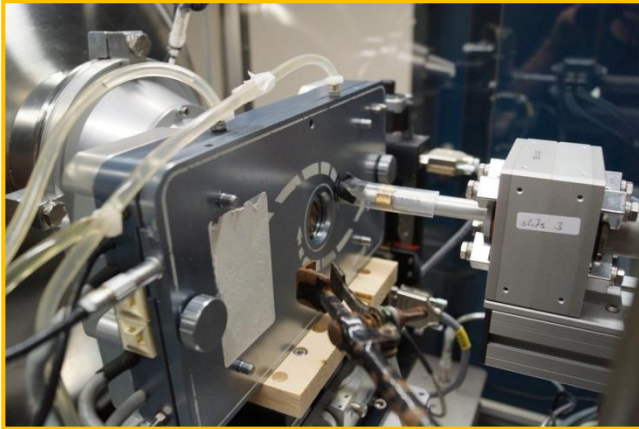
Sample Width: 0.001 to 22mm  
Sample Thickness: 0.001 to 2mm  
Minimum Sample length: 26mm  
Tensile speed range: 1-1000 $\mu\text{m/s}$   
Tensile Force range: 0.01N to 20N or 0.1 to 200N  
Force resolution: 0.001N or 0.01N dependent on transducer  
Maximum Travel: 80mm  
Positional Resolution: 10 $\mu\text{m}$   
Temperature range: -10 to 350°C



[Mechanism of Behavior of Two-Way Shape Memory Polymer under Constant Strain Conditions](#)

Posada-Murcia, JM Uribe-Gomez, S Förster, JU Sommer, M Dulle, ...  
*Macromolecules* 55 (5), 1680-1689

- Shear cell Linkam CSS 450

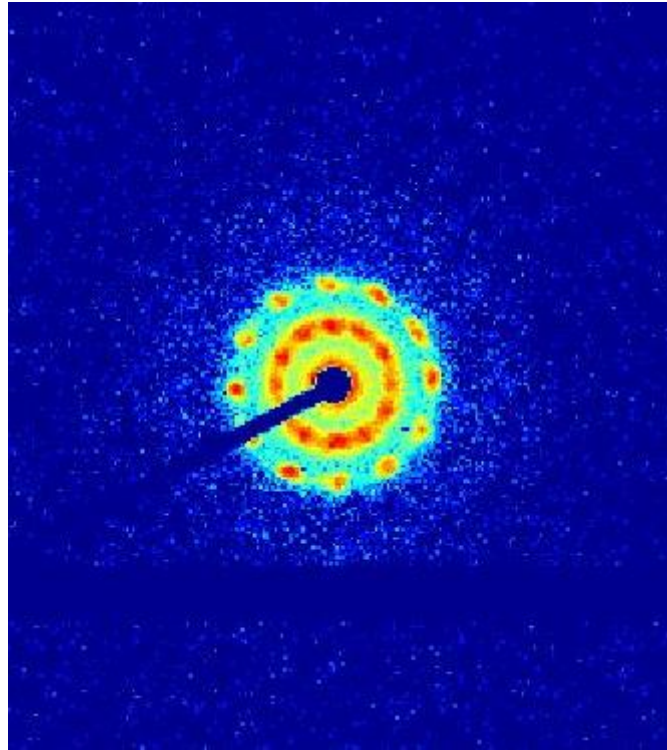


Linkam CSS 450 shearcell

$15^{\circ}\text{C} < T < 100^{\circ}\text{C}$

Good for Gels or liquid crystalline samples or highly concentrated liquids

Direct monitoring of sheared sample

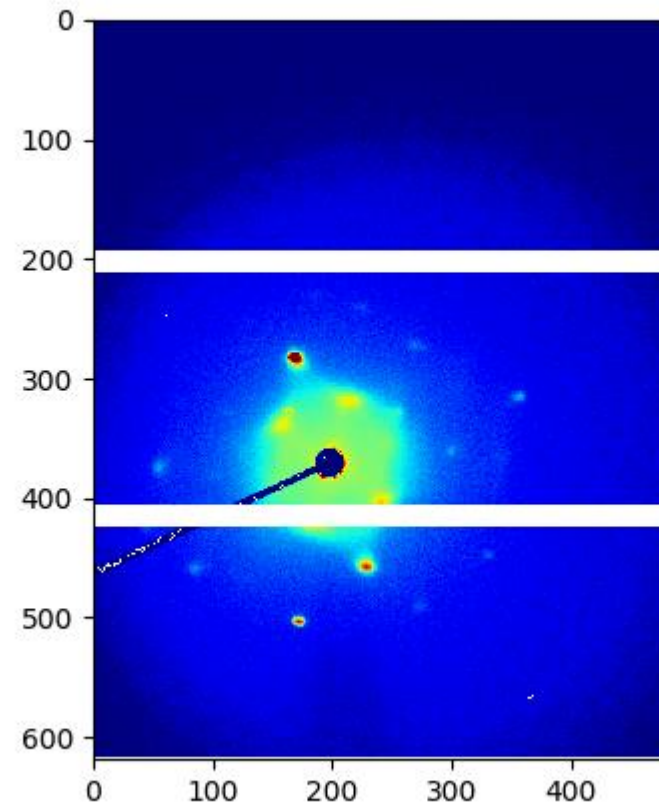
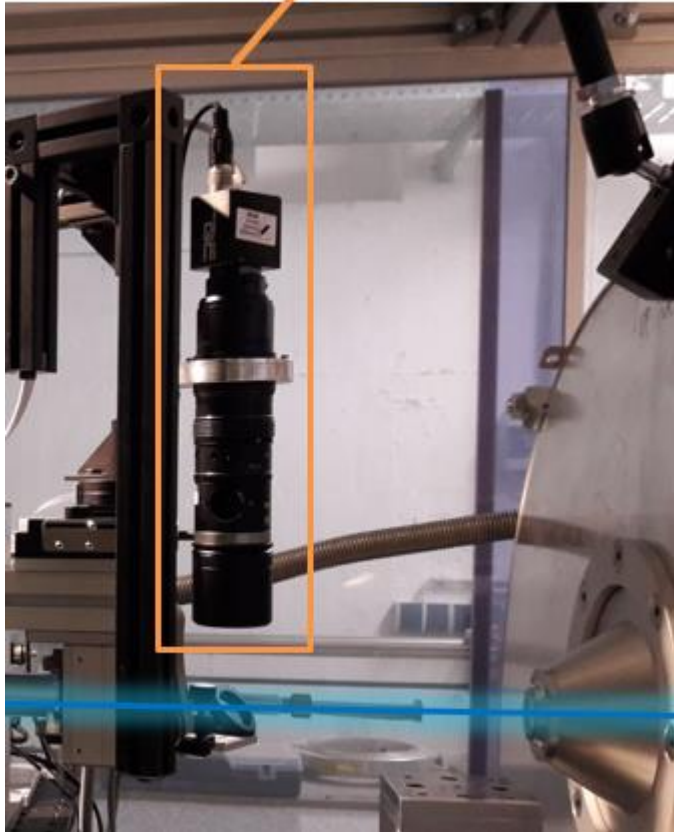


- Special setup for rotating colloidal crystals

Combination of 6 motors with microscope camera

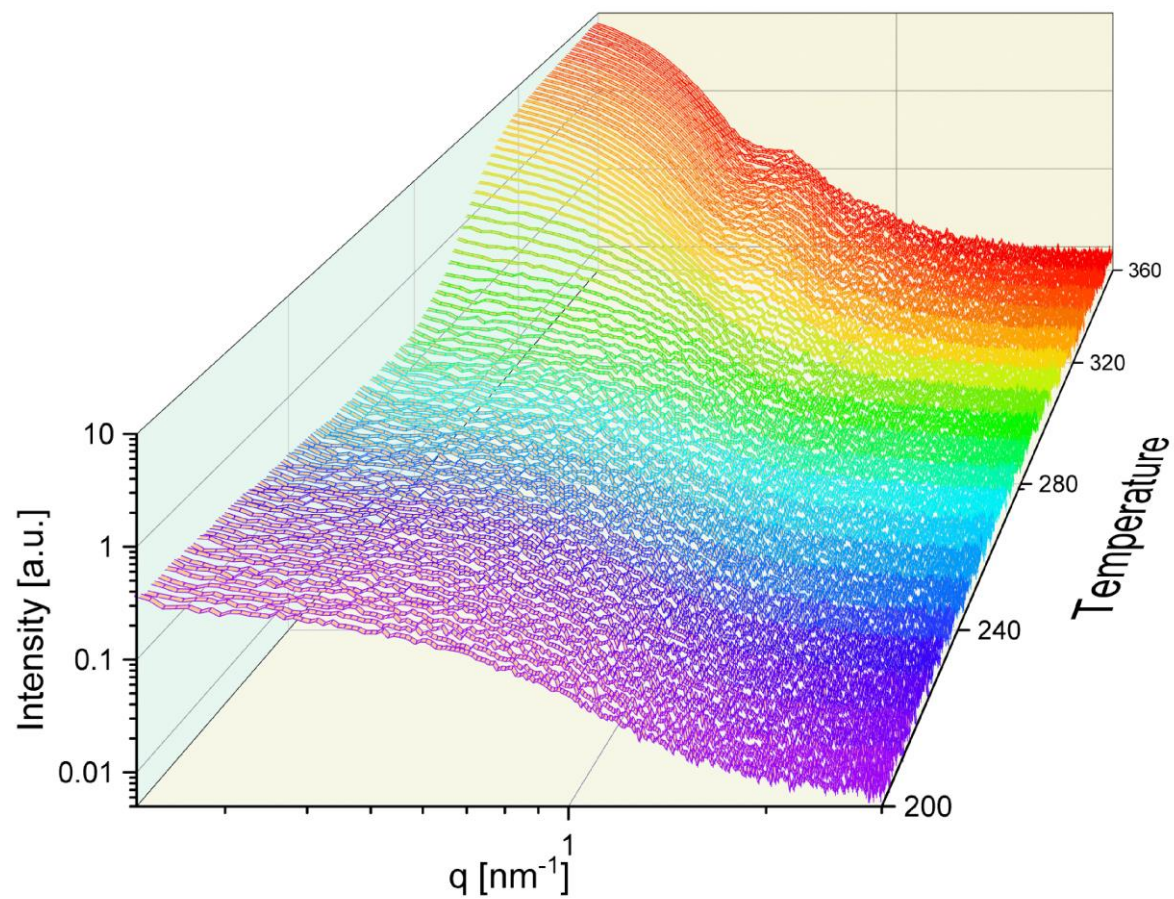
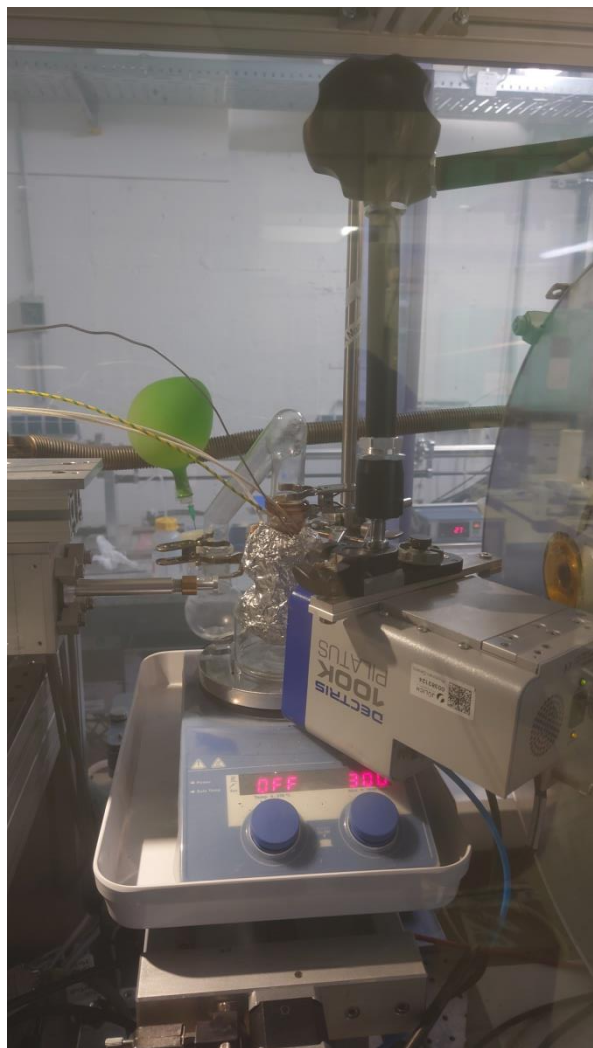
allows for centered 360° rotation of <math><100\mu\text{m}</math> samples within the Xray beam

Microscope

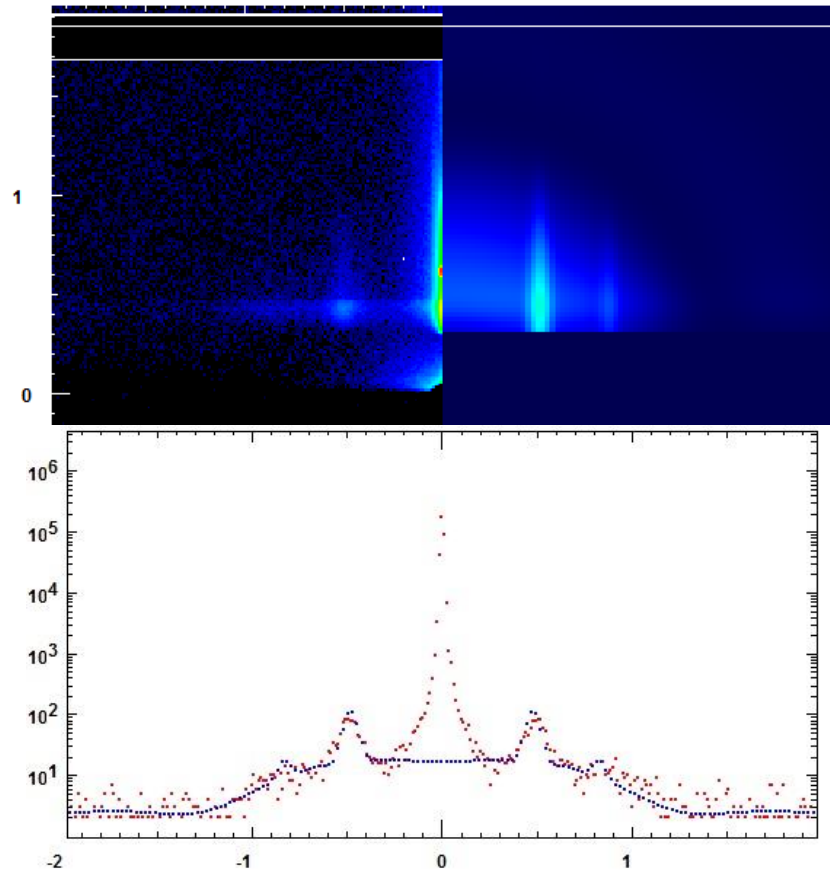


# Nanoparticle growth kinetics X-Ray transparent reaction vessel up to 380°C

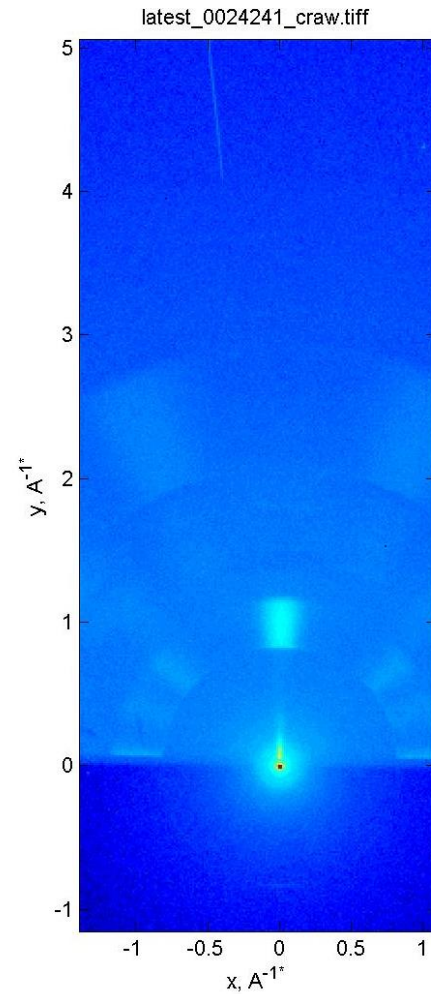
SAXS/WAXS with 10s time resolution



# GiSAXS and GiWAXS



Inkjet printed hexagonal  $\text{FeO}_x$   
Nanopartikel monolayer



Perovskites deposited on an Si-Wafer