

Application Gallery

POLYMERS

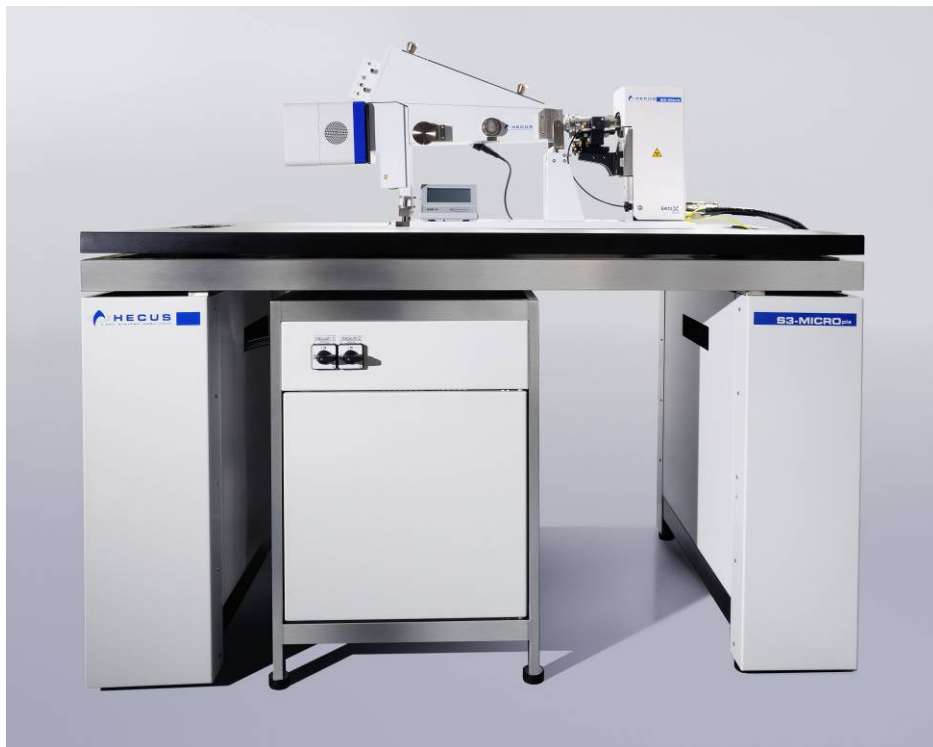
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FIBRES PROTEINS THIN-SOLID-FIL
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HIGHLIGHTS OF S3-MICRO

- The point-focussing beam geometry of S3-MICRO has proven highly advantageous by offering the possibility selecting high-flux (MAXS) and high resolution (SAXS) mode, resp.
- Experimental setup for different samples (e.g. for powders, liquids) can be changed and adapted quickly.
- Modular setup allows quick adaptation to use different detectors and/or q-ranges
- Measurements may require less than 10 minutes per sample

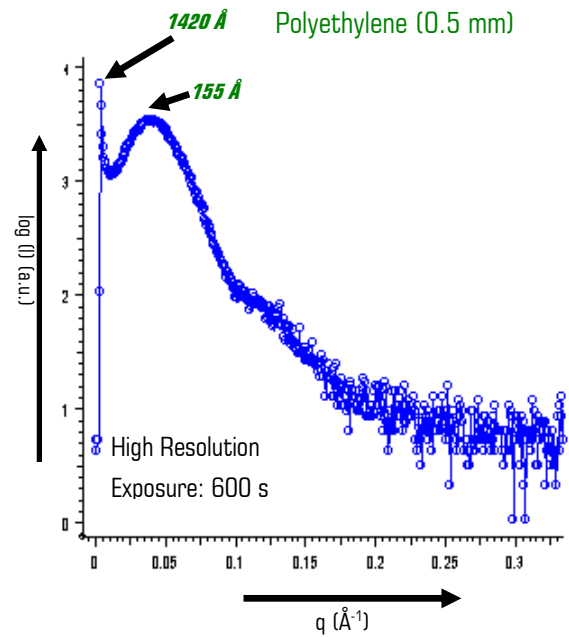
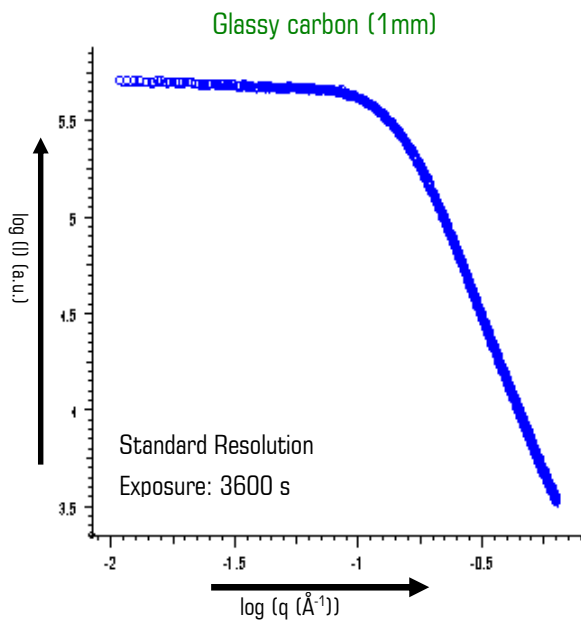


POLYMERS

Glassy Carbon and Polyethylene

Experimental Setup

Samples	Solid Polymers
Camera	Hecus S3-MICRO (point focus)
X-rays	Cu-K α ($\lambda = 1.54 \text{ \AA}$)
Power	50 kV, 1 mA (50 W)
Collimation Setting	High resolution, Standard Flux
Detectors	Mythen: 1280 pixels (50 μm),
Sample-detector distance	276 mm (SAXS)
Calibration	by (SAXS/MAXS) Ag-stearate ($d = 48.68 \text{ \AA}$)
Temperature	20°C
Exposure time	600 s, 3600 s

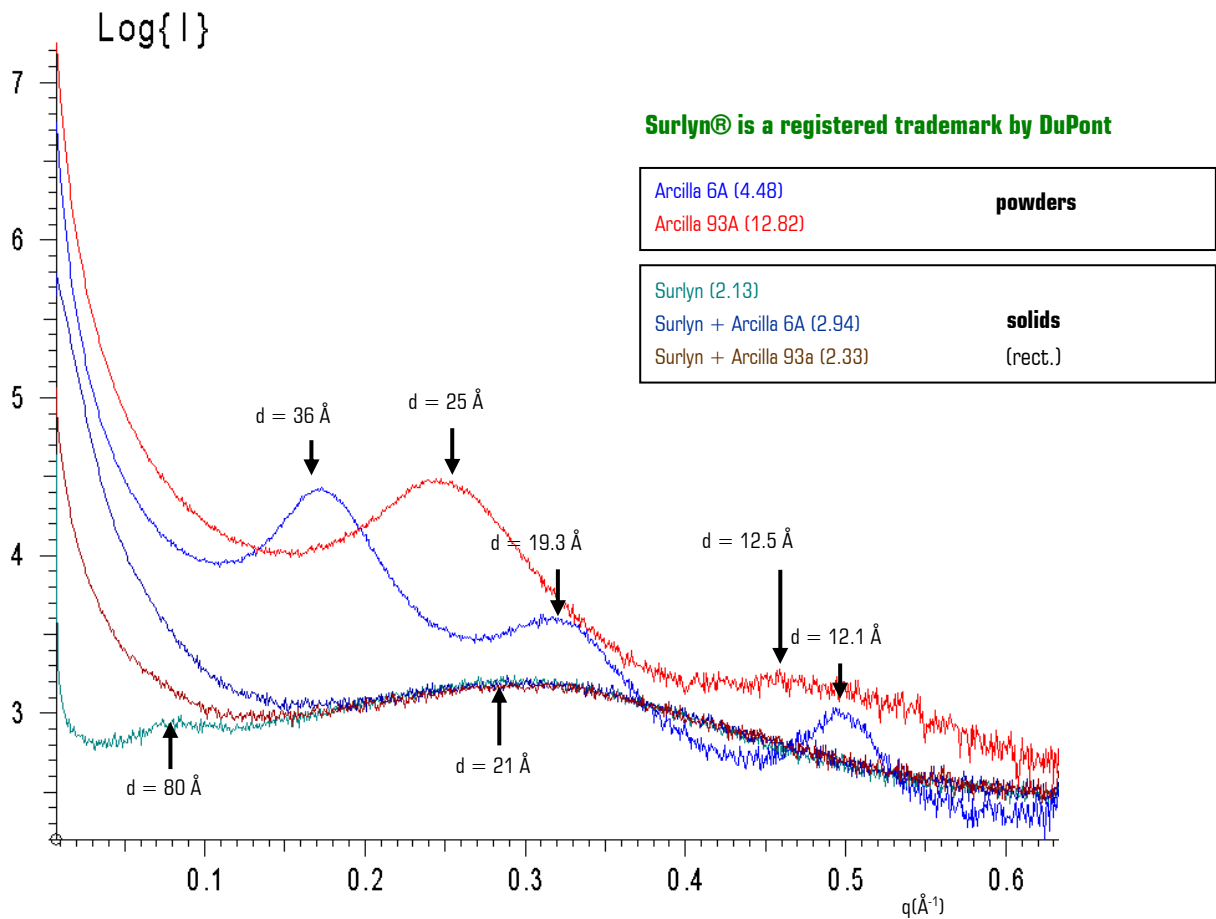


Solid Polymers

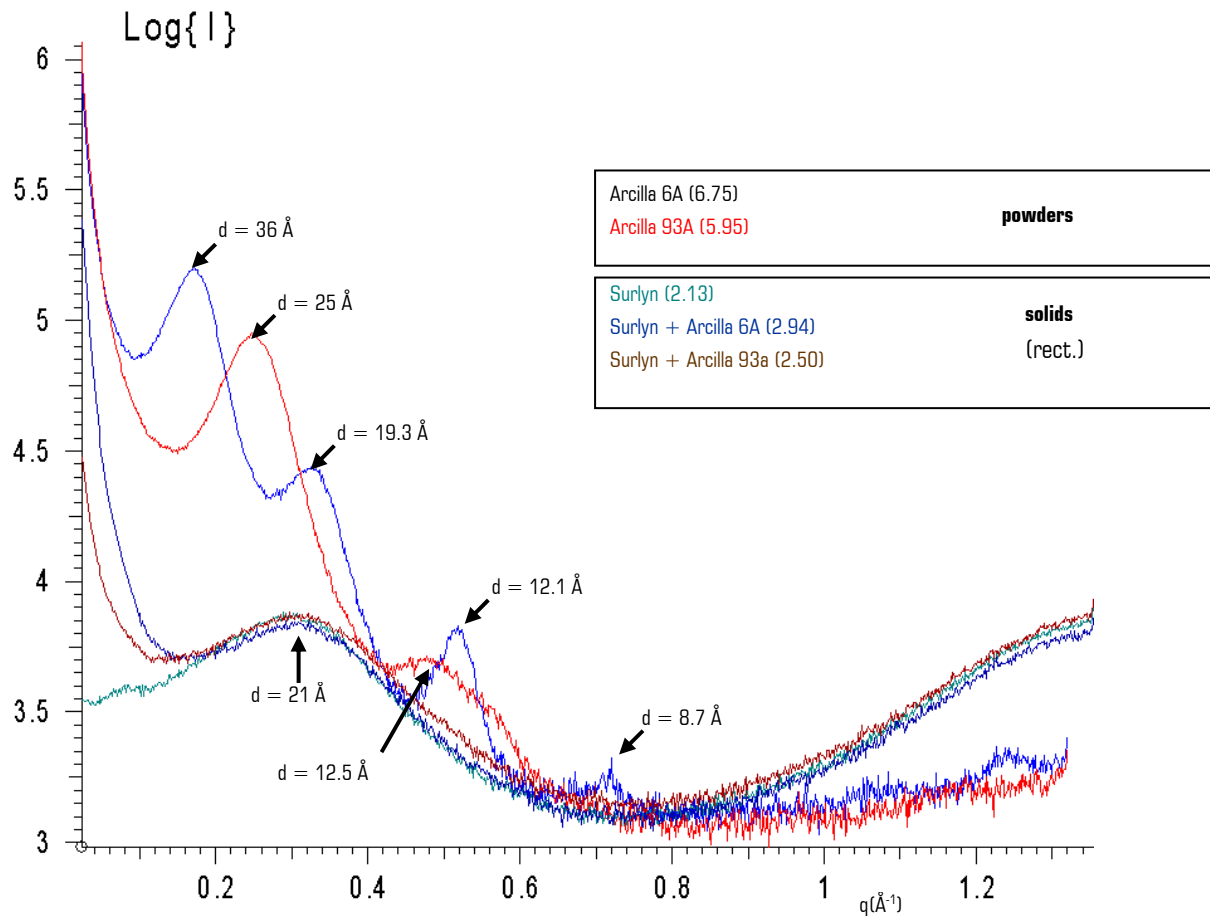
Experimental Setup

Samples	Powders: filled in capillaries of 1.5 mm \varnothing and sealed Solid pieces: directly placed into the beam: 1.4 -1.8 mm thick
Camera	Hecus S3-MICRO (point focus)
X-rays	Cu-K α ($\lambda = 1.54 \text{ \AA}$)
Power	50 kV, 1 mA (50 W)
Collimation Setting	Standard Flux
Detectors	SAXS and MAXS: Mythen: 1280 pixels (50 μm) WAXS: 1D-PSD: 1024 pixels (54 μm)
Sample-detector distance	285 mm (SAXS), 127 mm (MAXS), respectively
Calibration	by (SAXS) Ag-stearate ($d = 48.68 \text{ \AA}$) by (WAXS) p-bromo-benzoic-acid
Max. measured q-ranges	SAXS: 0.6 \AA^{-1} // MAXS: 1.2 \AA^{-1} // WAXS: $1.2 \text{ \AA}^{-1} < q < 2.0 \text{ \AA}^{-1}$
Temperature	20°C
Exposure time	600 s

SAXS normalized (to transmission)



MAXS normalized (to transmission)

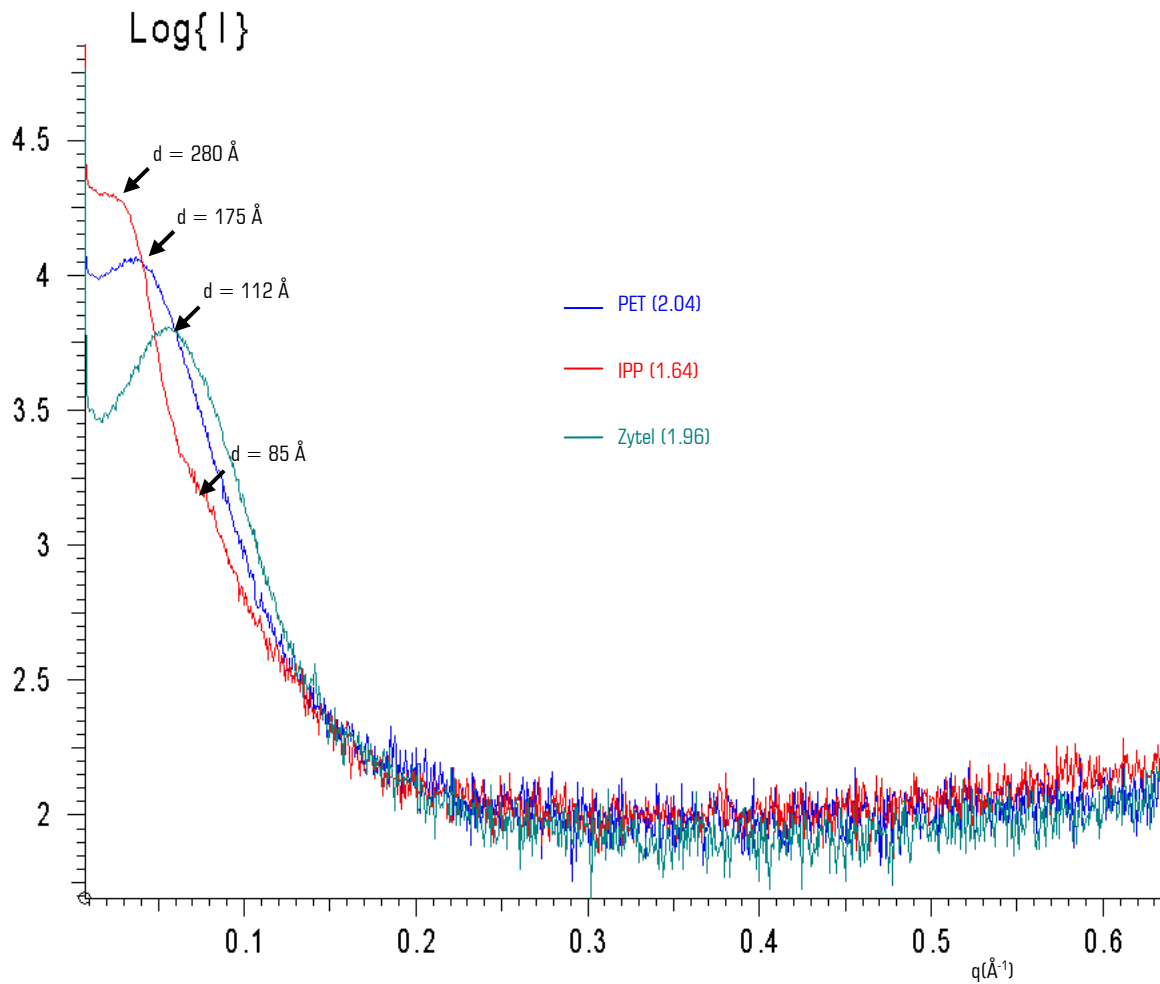


SAXS from solid polymers PET, IPP and Zytel (normalized)

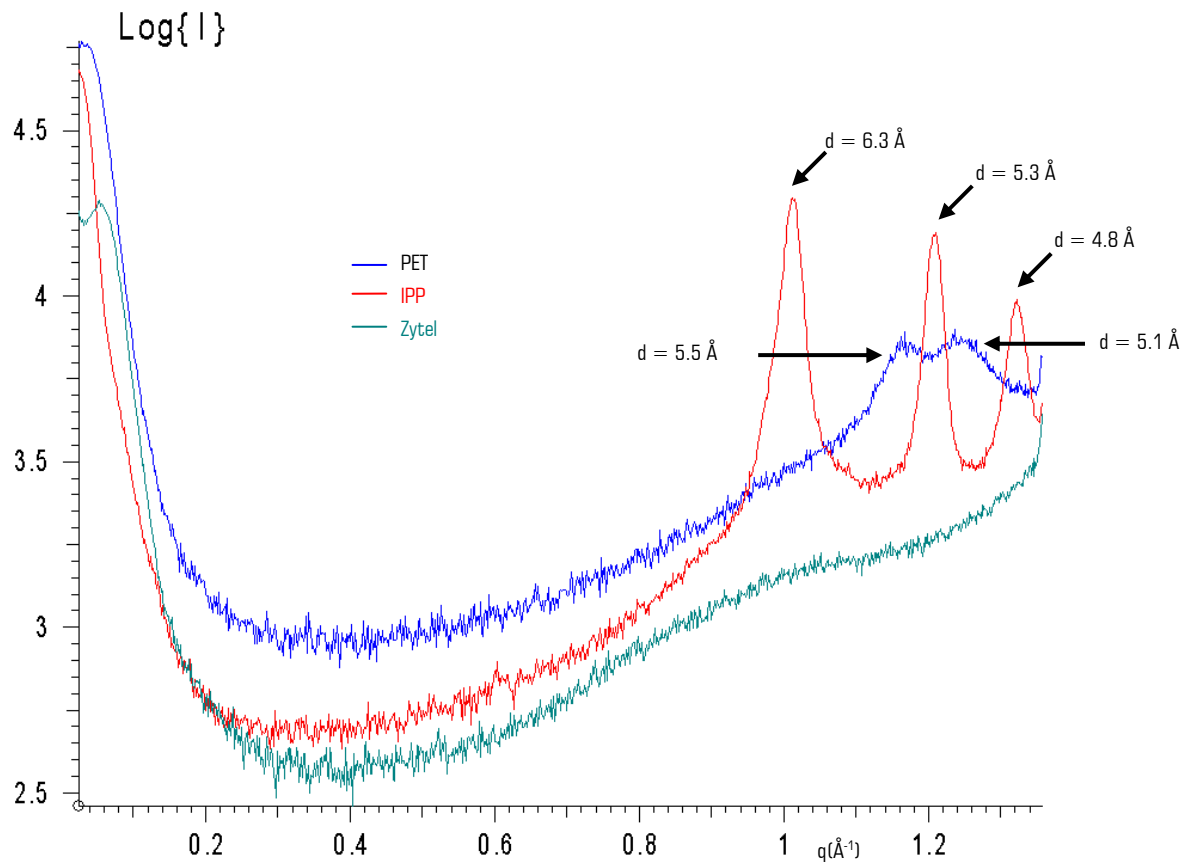
PET → Polyethylene Terephthalate

IPP → Isotactic Polypropylene

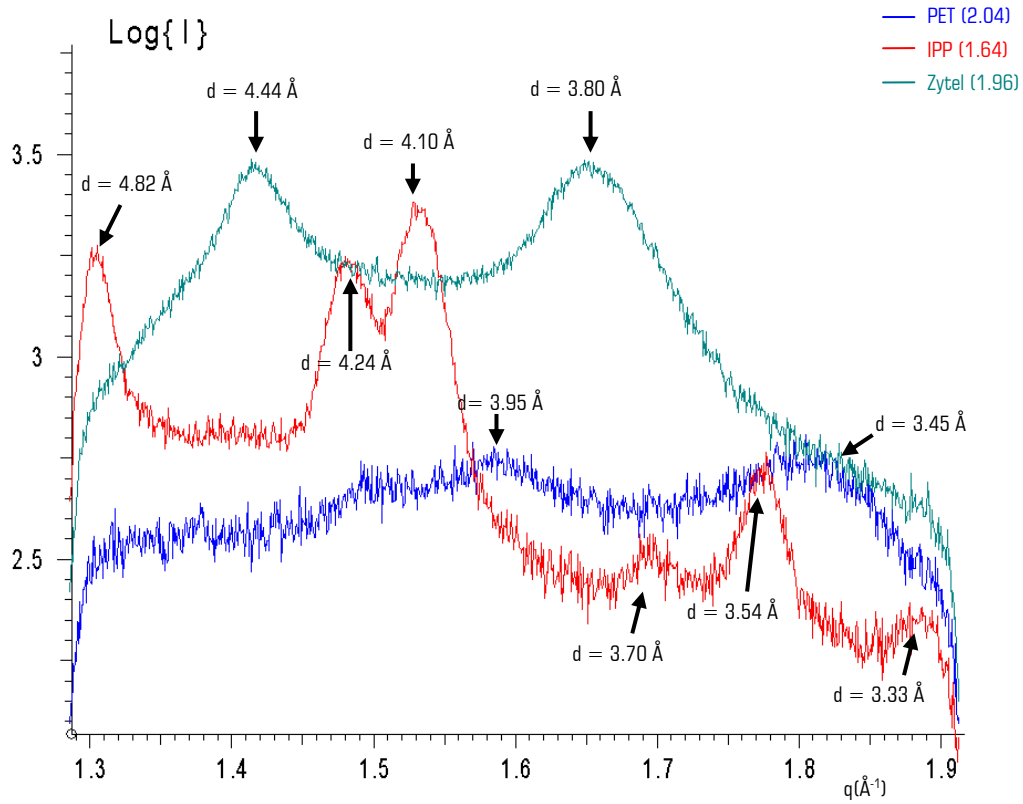
Zytel® → registered trademark by DuPont



MAXS from solid polymers PET, IPP and Zytel (normalized)



WAXS from solid polymers PET, IPP and Zytel (normalized)

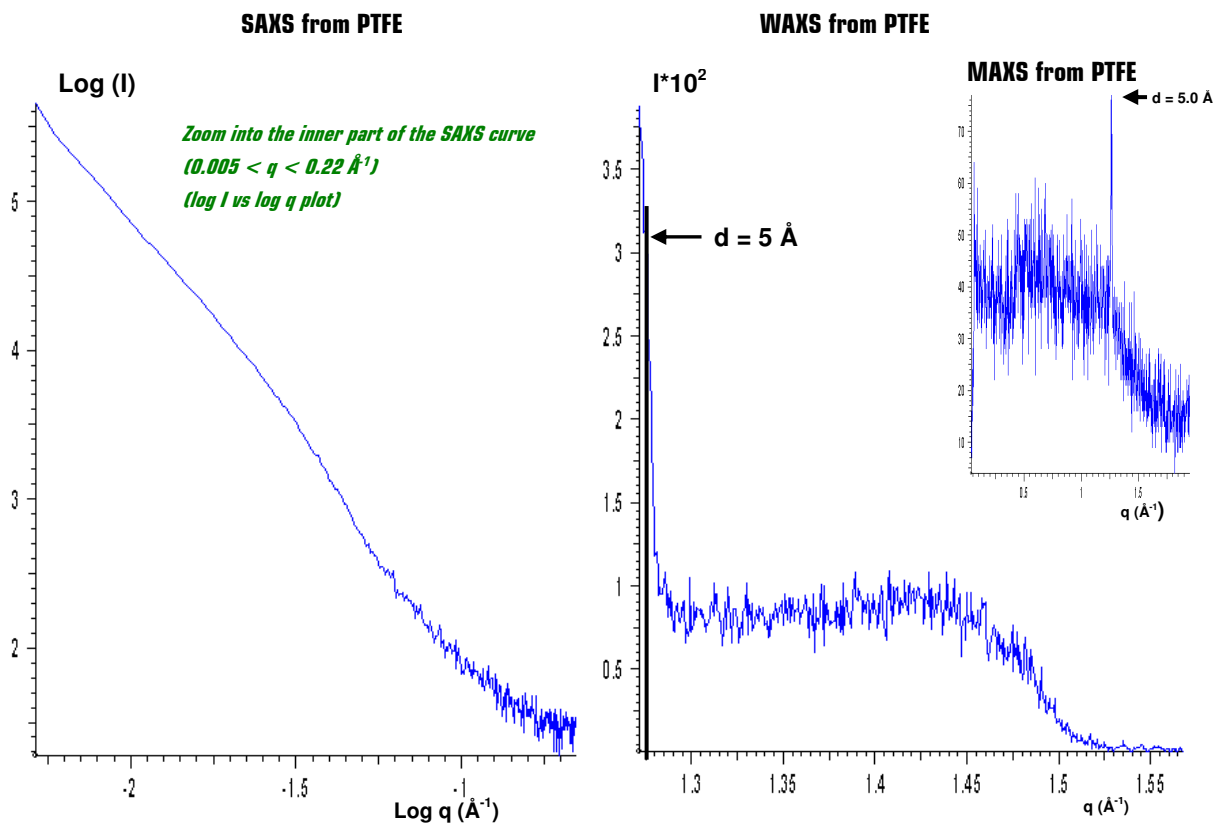


Polymer Coating of Thin Stainless Steel Wire

Experimental Setup

Samples	Several thin stainless steel wires coated with PTFE were placed horizontally stacked upon each other in the sample holder
Camera	Hecus S3-MICRO (point focus)
X-rays	Cu-K α ($\lambda = 1.54 \text{ \AA}$)
Power	50 kV, 1 mA (50 W)
Collimation Setting	Standard Flux
Detectors	SAXS/MAXS/WAXS: Mythen: 1280 pixels ($50 \mu\text{m}$),
Sample-detector distance	276 mm (SAXS), 82 mm (MAXS)
Calibration	by (SAXS/MAXS) Ag-stearate ($d = 48.68 \text{ \AA}$) by (WAXS) p-bromo-benzoic-acid
Temperature	20°C
Exposure time	1800 s

SAXS & WAXS from PTFE Wire Coating ($100 \mu\text{m}$)



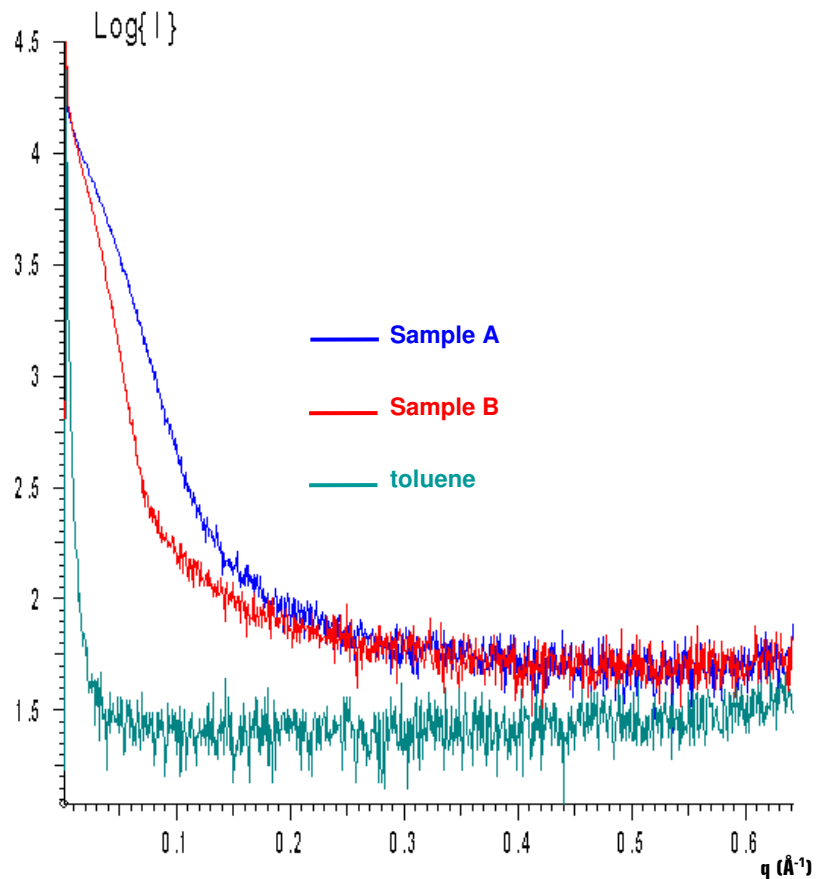
Colloidal Noble Metal Polymer Solutions in Toluene

Experimental Setup

Samples	2 samples of colloidal noble metal polymer solutions in toluene filled in capillaries of 1.0 mm \varnothing
Camera	Hecus S3-MICRO (point focus)
X-rays	Cu-K α ($\lambda = 1.54 \text{ \AA}$)
Power	50 kV, 0.60 mA (50 W)
Resolution	vertical): 50 μm
Detectors	Mythen: 1280 pixels (50 μm)
Sample-detector distance	276 mm
Calibration	by (SAXS) Ag-stearate ($d = 48.68 \text{ \AA}$)
Temperature	20°C
Exposure time	1800 s

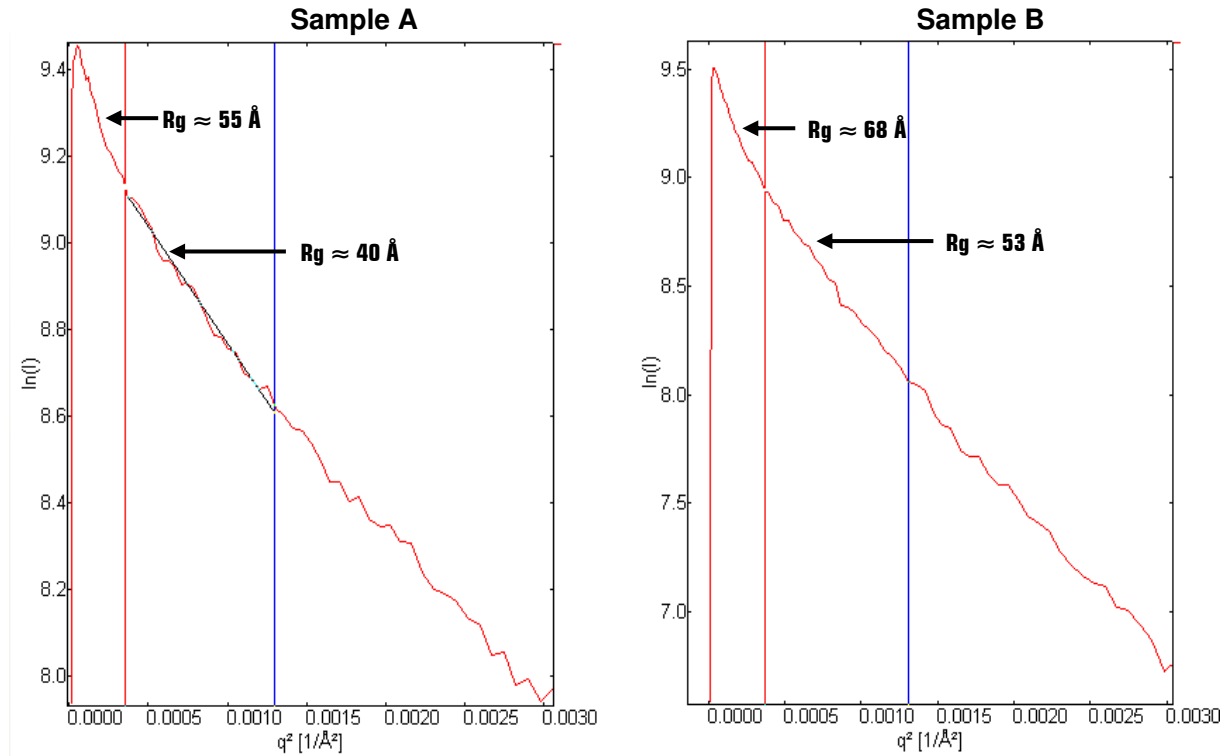
SAXS-curves raw data in a log I vs q plot (not normalized)

The transmission ratio (T_s/T_b) between the samples and the blank (toluene) was 1.6



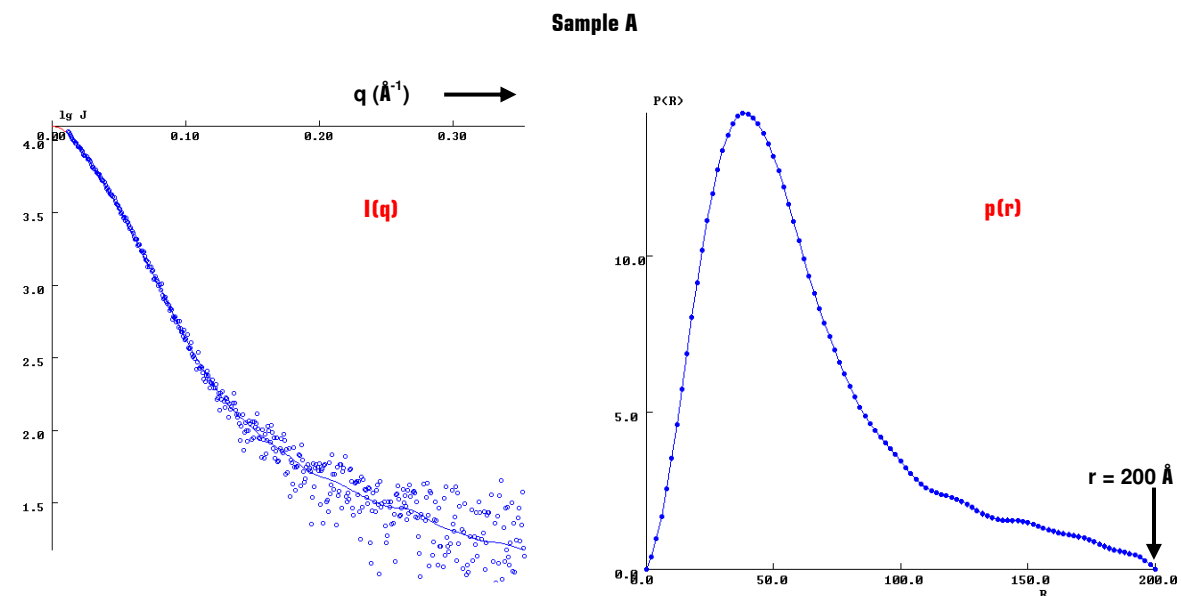
Guinier-plots with the resulting radii of gyration (R_g) of sample A and B

R_g of the inner-most region $0.0096 < q < 0.0199 \text{ \AA}^{-1}$ (sample A 55 \AA , sample B 68 \AA) and in the subsequent region $0.0192 < q < 0.0362 \text{ \AA}^{-1}$ (sample A 40 \AA , sample B 53 \AA). The Guinier-plots suggest there might be some larger sized aggregates in the sample and/or a polydisperse size distribution of the particles



Fourier-Transformation of the SAXS-curve

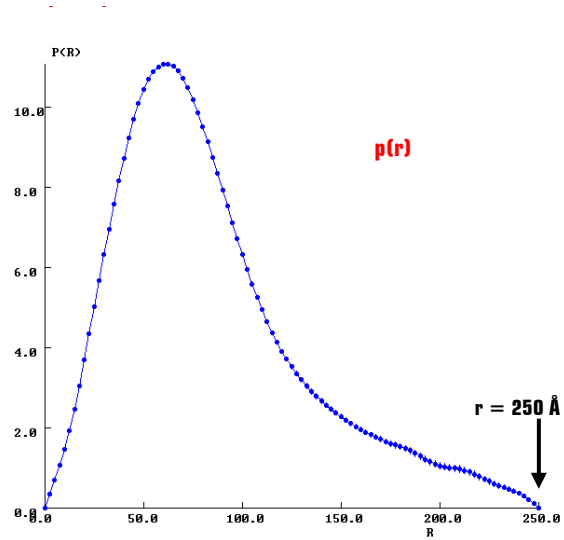
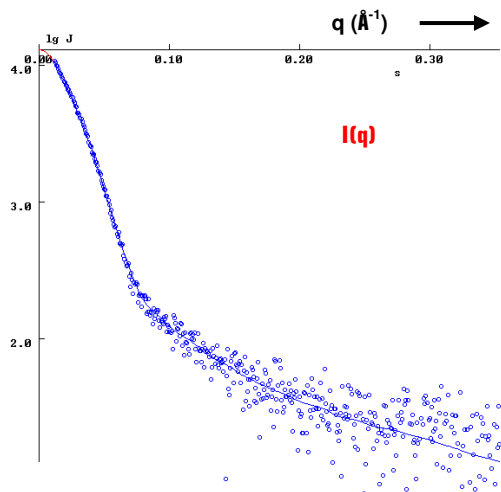
Fourier-Transformation of the SAXS-curve ($0.0118 < q < 0.353 \text{ \AA}^{-1}$) to obtain the distance distribution function $p(r)$ in real space. The resulting $p(r)$ function shows a maximum at 51 \AA and a maximum diameter of about 200 \AA .



Fourier-Transformation of the SAXS-curve

Fourier-Transformation of the SAXS-curve ($0.0118 < q < 0.353 \text{ \AA}^{-1}$) to obtain the distance distribution function $p(r)$ in real space. The resulting $p(r)$ function shows a maximum at 68 \AA and a maximum diameter of about 250 \AA .

Sample B



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