Physics with neutrons (PH2053)

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Lecture 12

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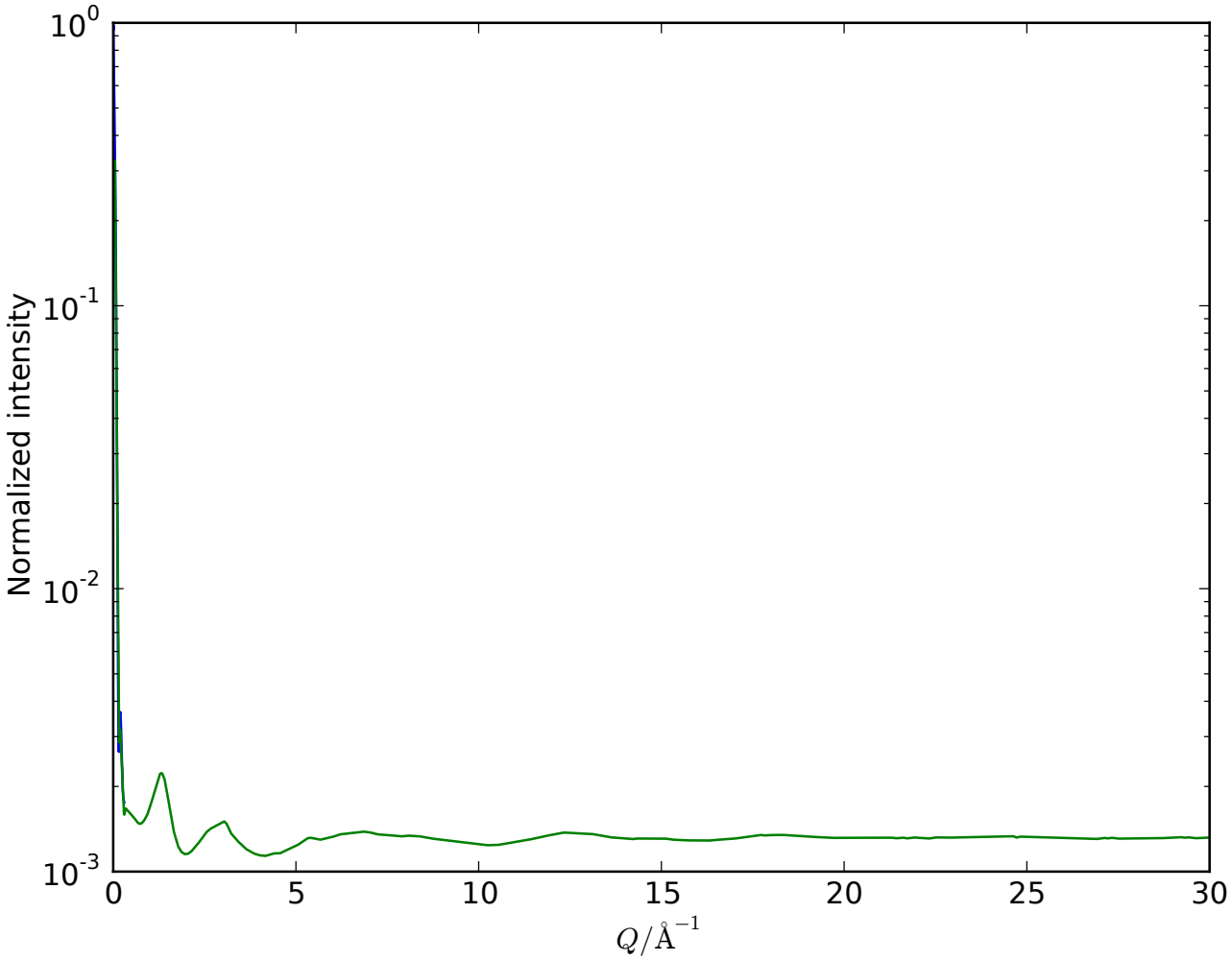
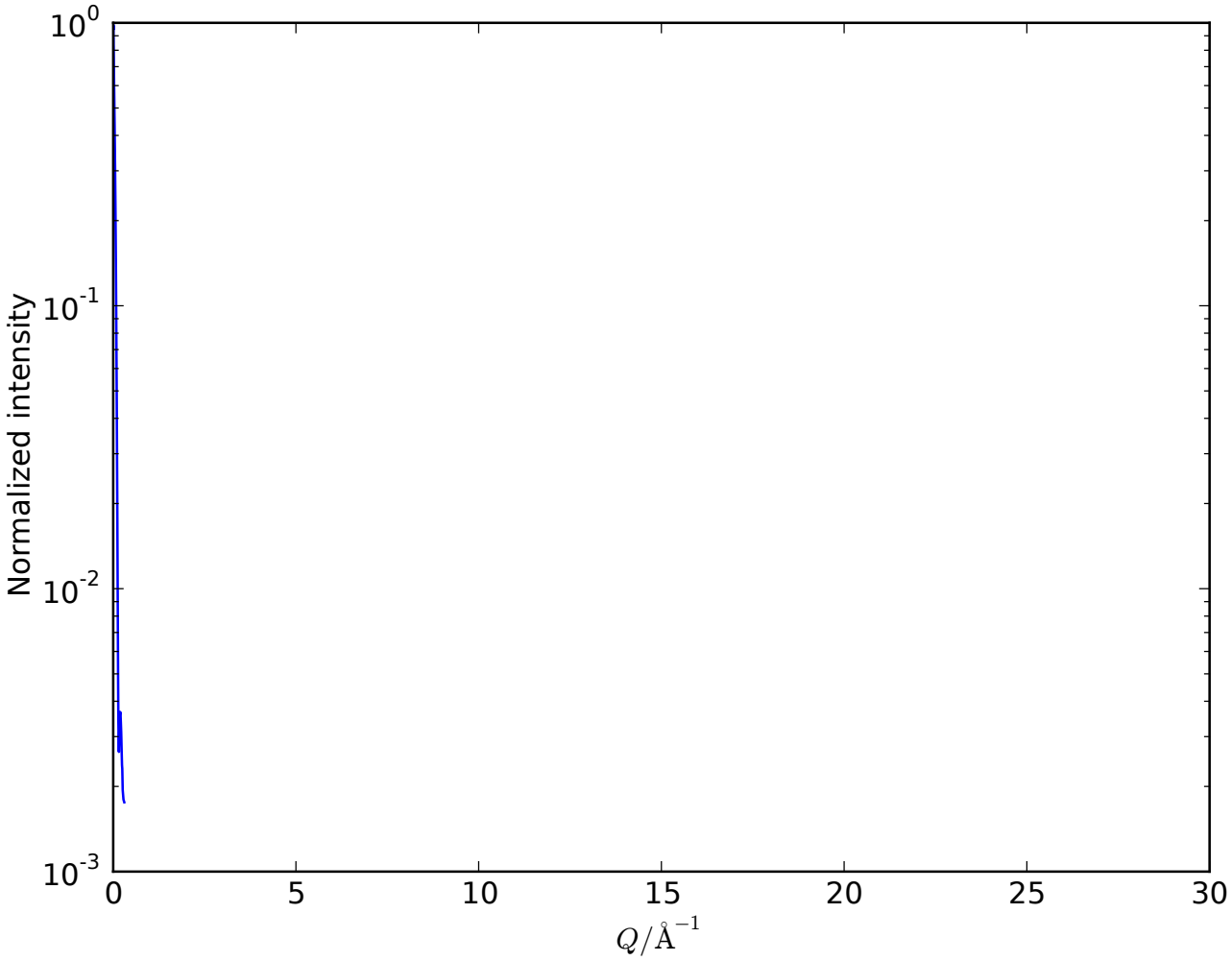
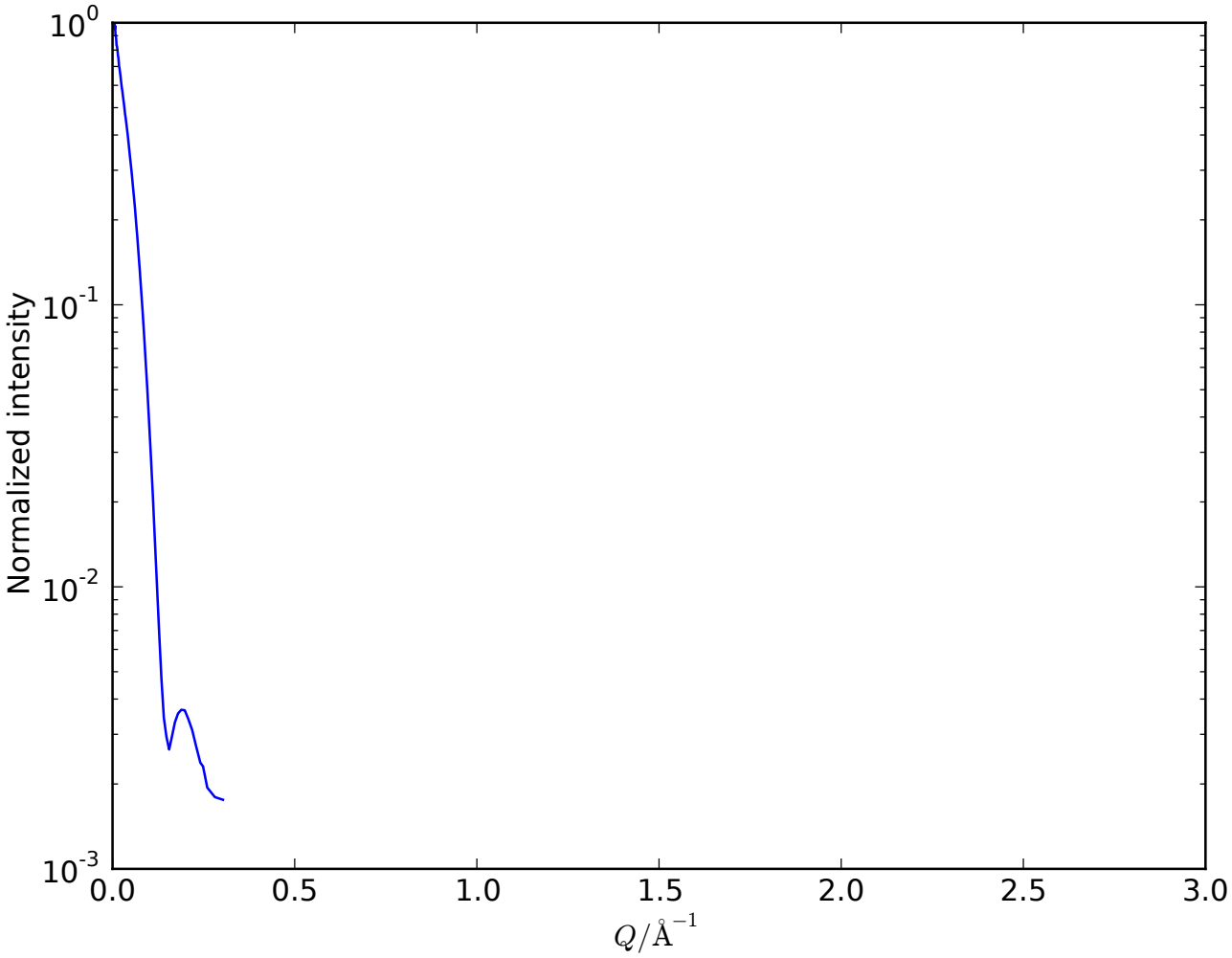
Wide vs. Small Angle Scattering



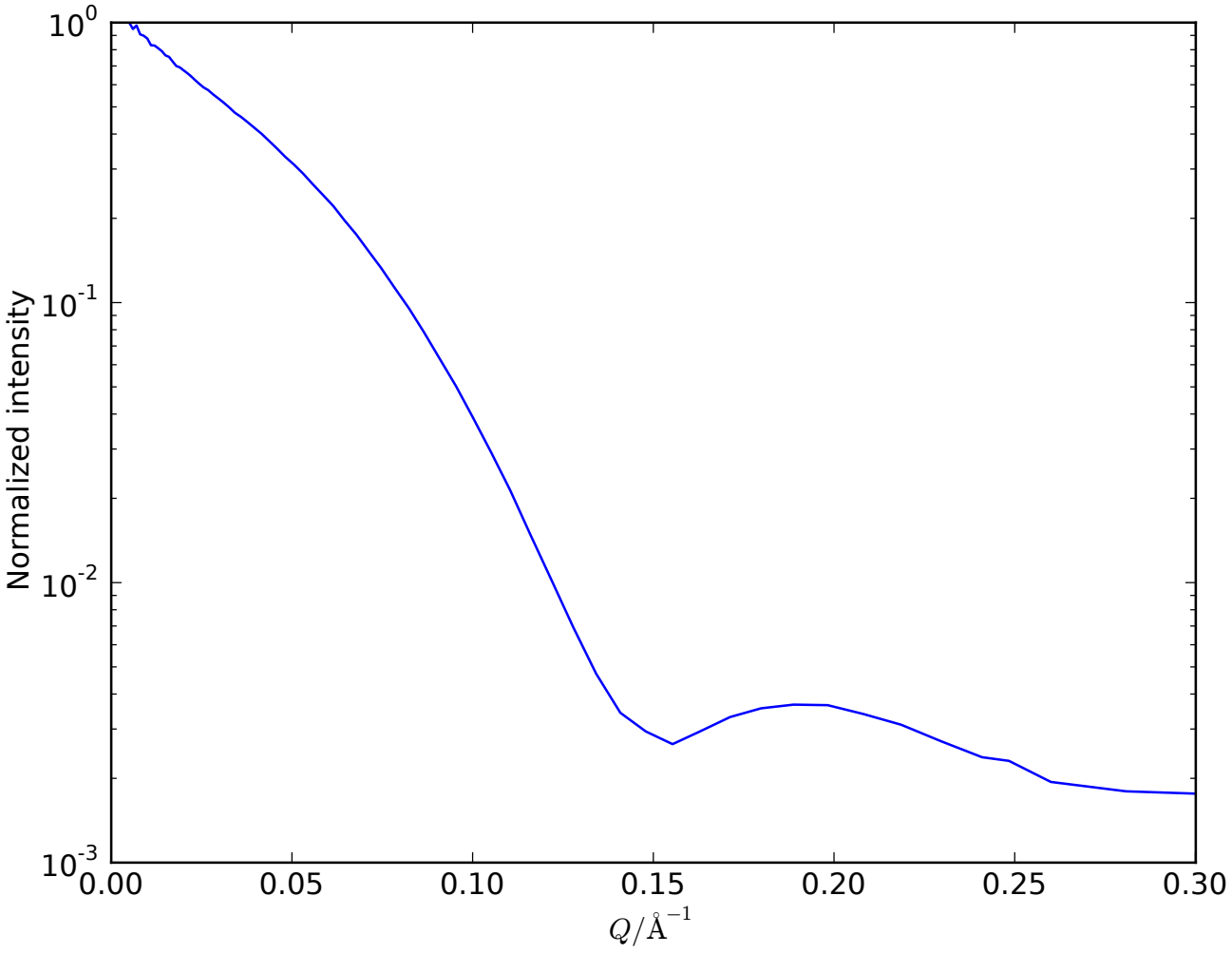
Wide vs. Small Angle Scattering



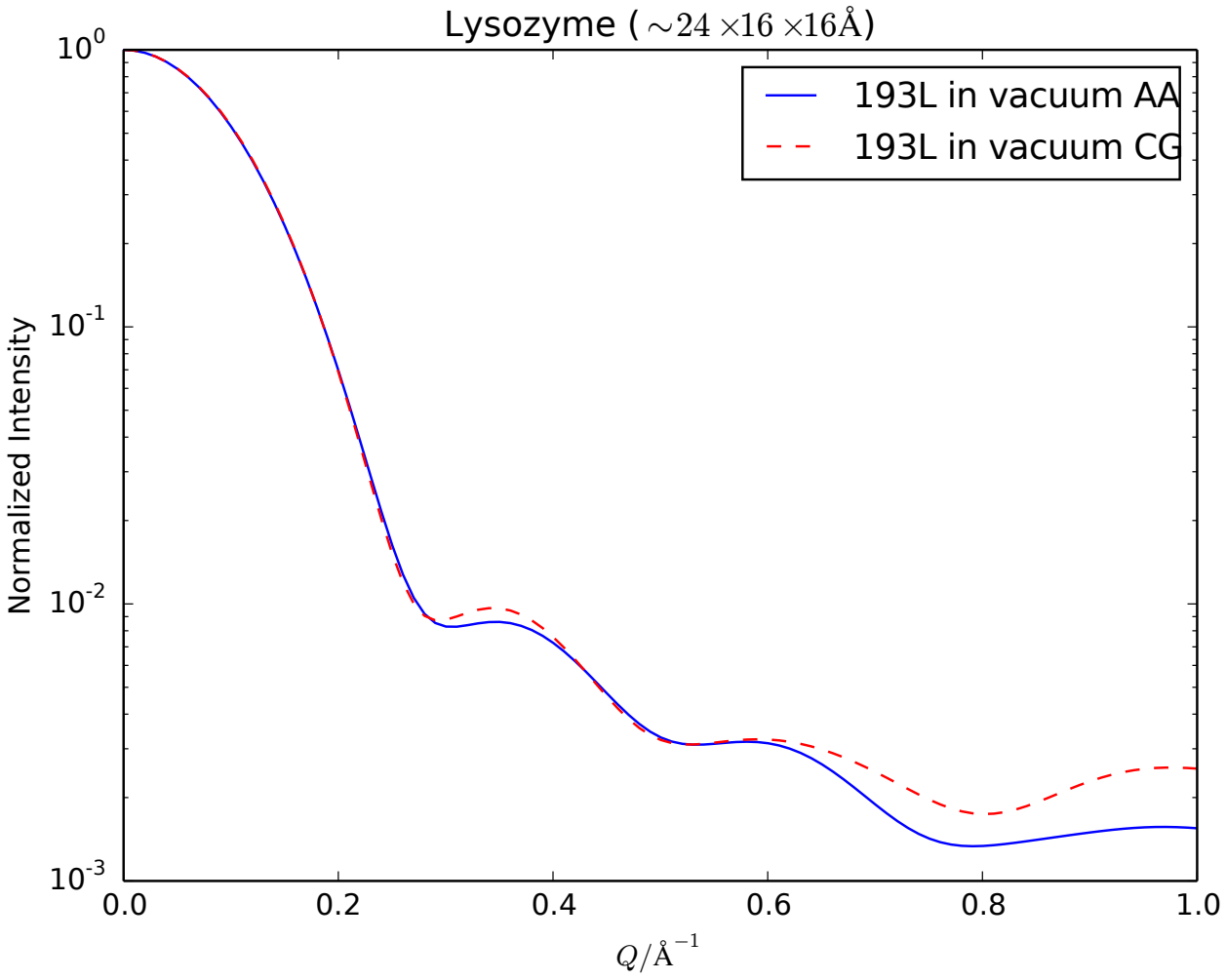
Wide vs. Small Angle Scattering



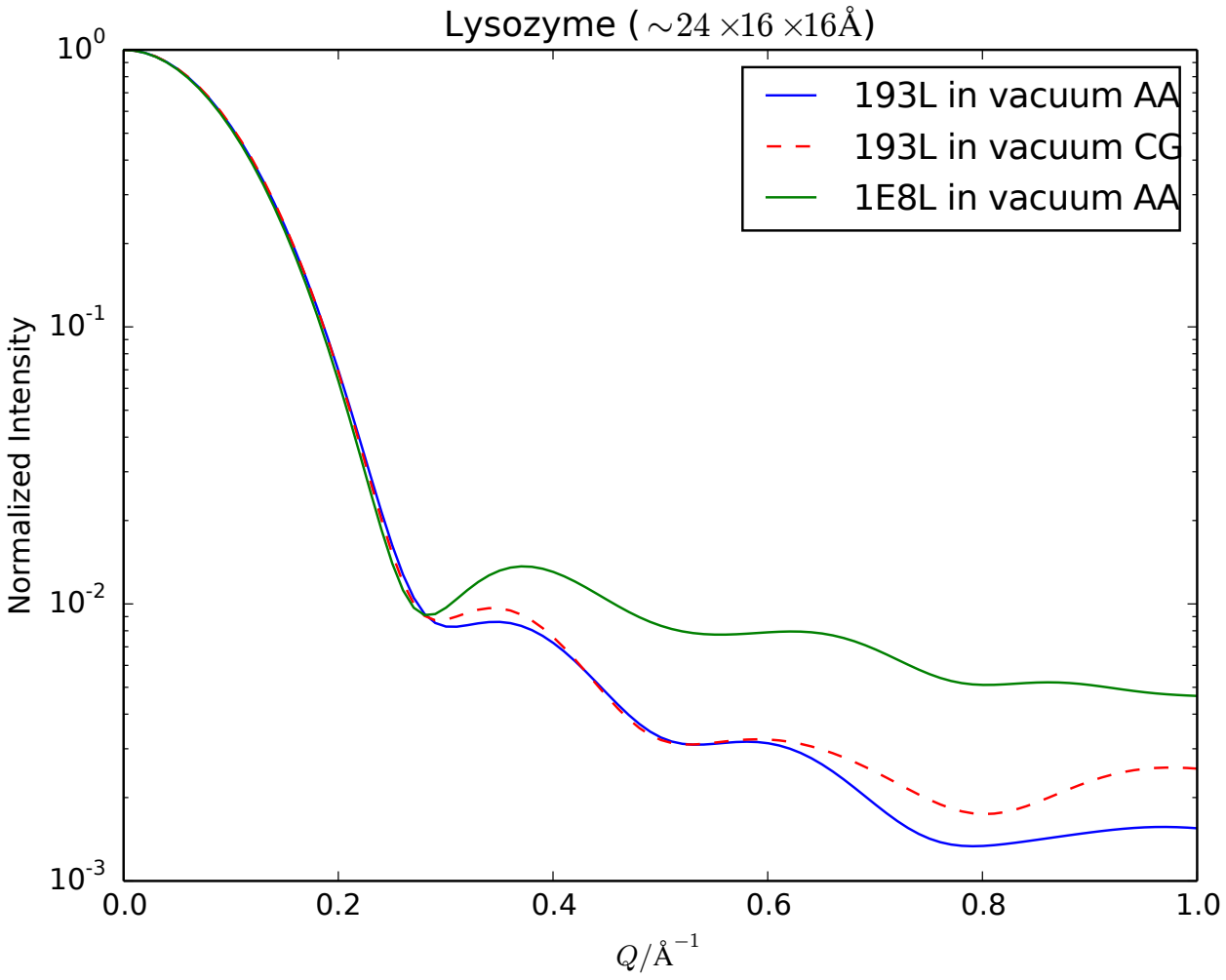
Wide vs. Small Angle Scattering



Calculated SANS



Calculated SANS



What do we measure?

Limit: Small angle scattering (SAS), two-phase particular system.
I. e. particles in matrix

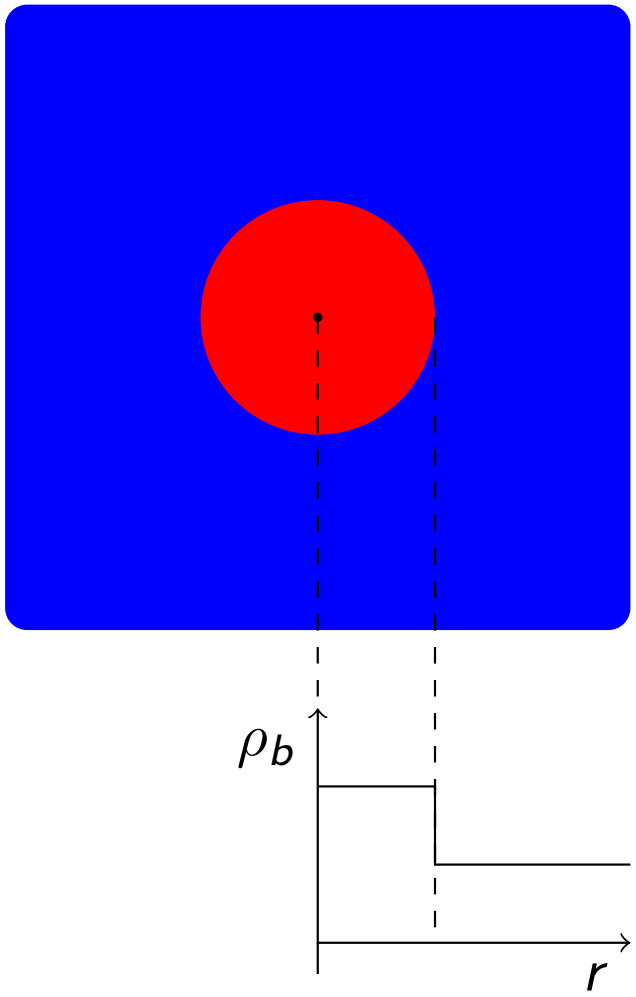
$$\frac{\mathrm{d}\Sigma}{\mathrm{d}\Omega}(q) \sim (\Delta\rho_b)^2 \cdot \langle |F(q)|^2 \rangle \cdot S(q)$$

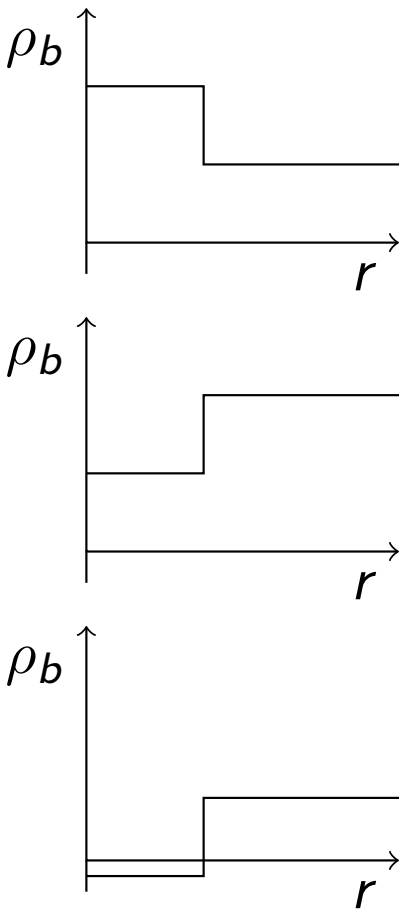
q (or Q)	absolute value of scattering vector
$\Delta\rho_b$	difference in scattering length density (SLD) ρ_b
$F(q)$	shape of the particles
$\langle \ldots \rangle$	orientational average
$S(q)$	arrangement of the particles

Optics: difference in index of refraction n

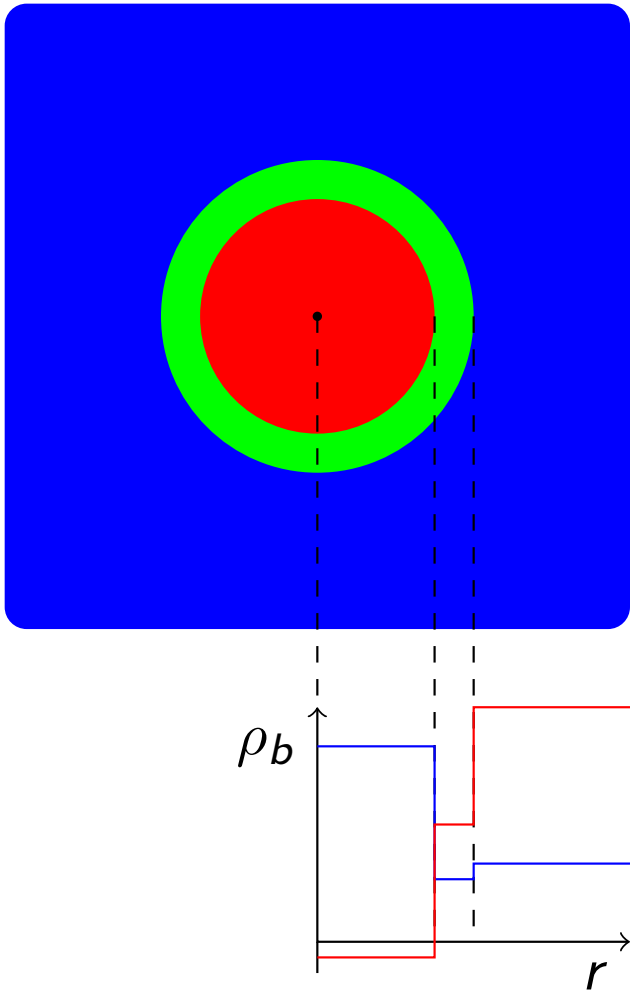
— http://runningwithteamhogan.com/properties-of-light-refraction-and-invisible-crystals/

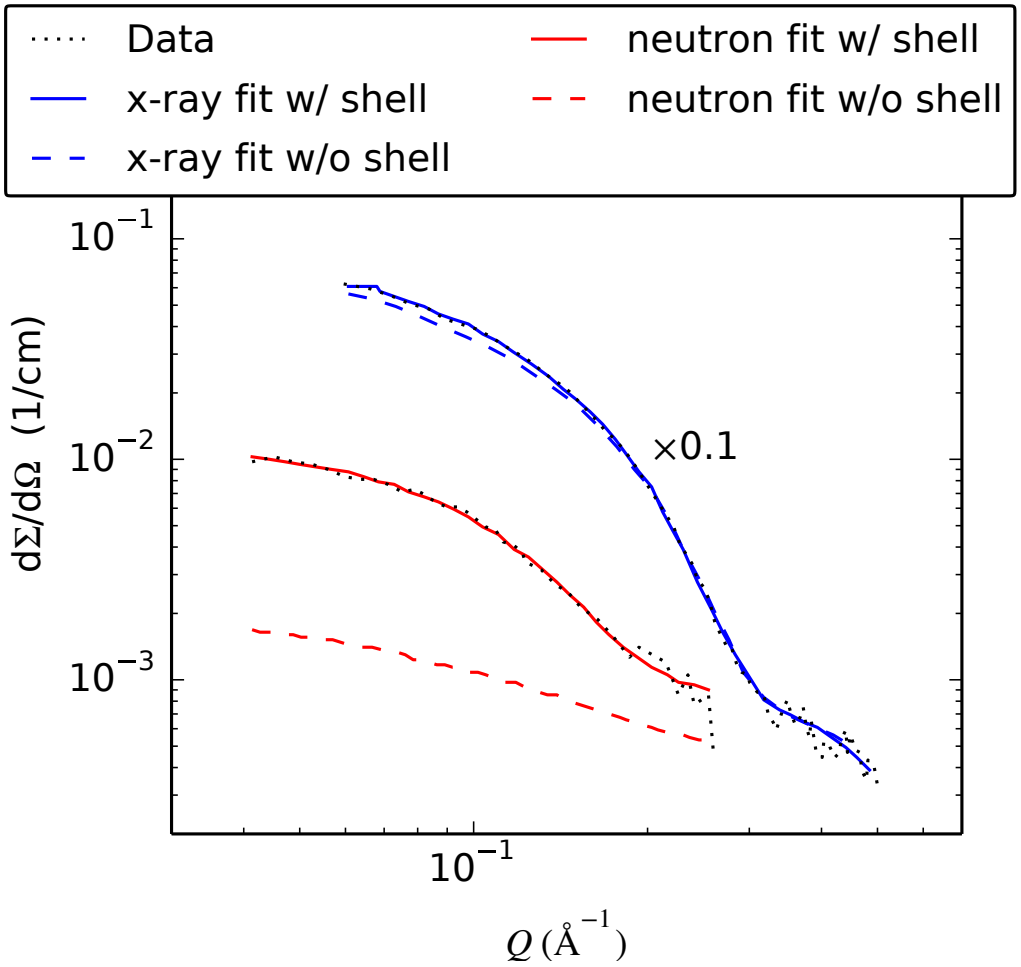
SAS: difference in SLD ρ_b





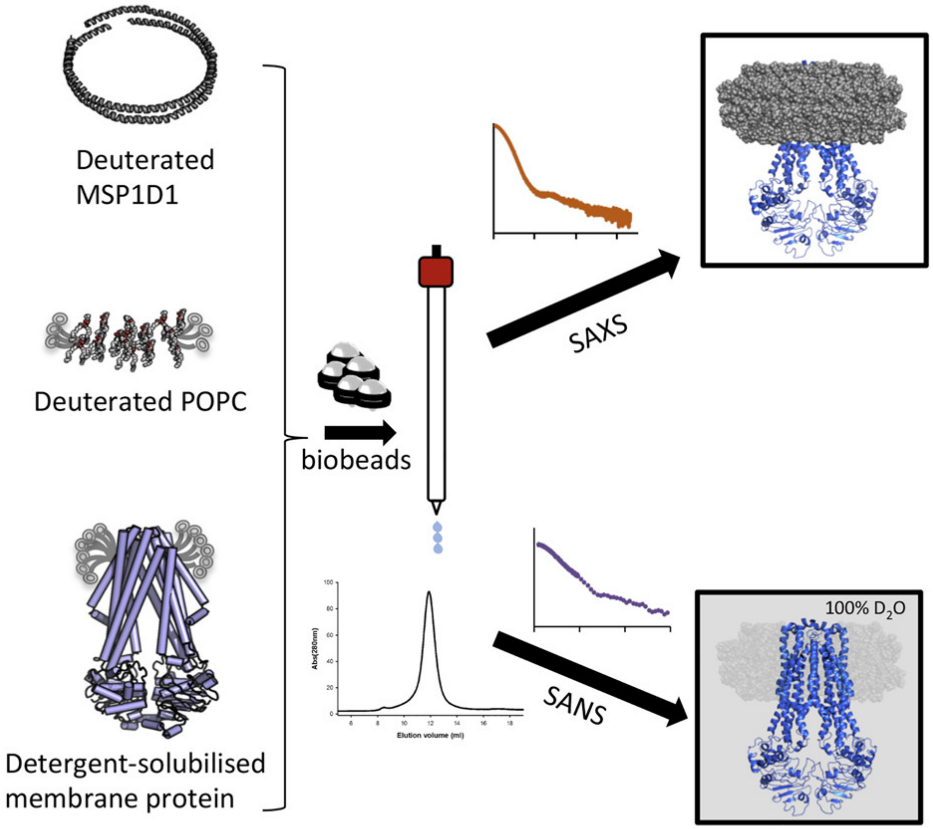
x vs n: example – ZnO nanoparticle, organic shell





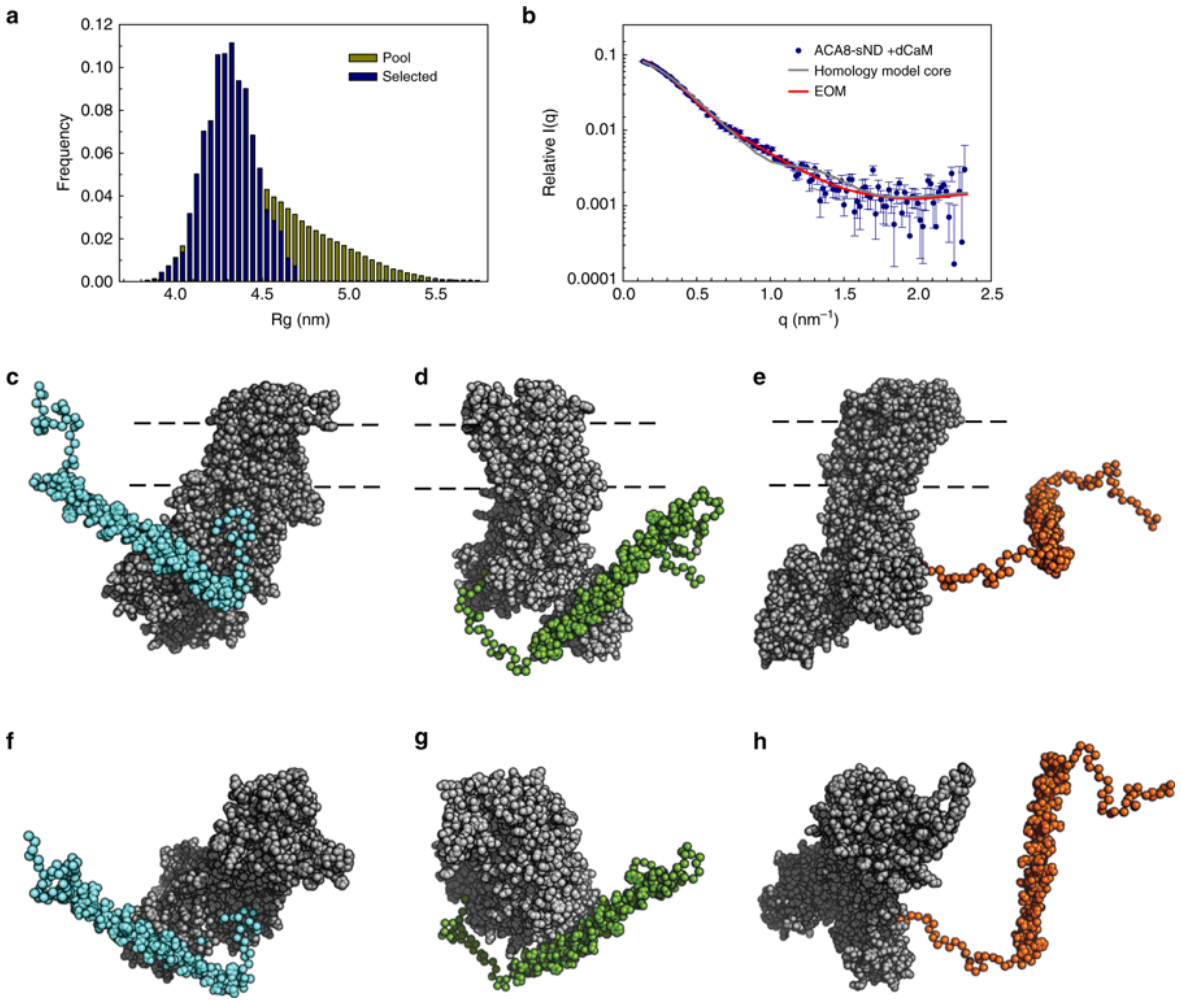
— T. Schindler et al., doi:10.1021/acs.langmuir.5b02198

Use contrast match to mask



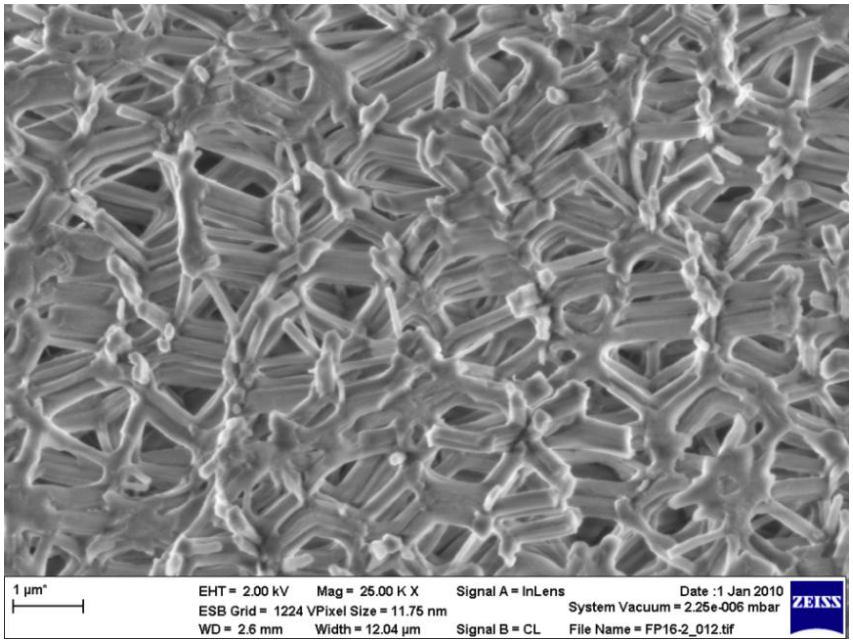
— I. Josts et al., doi:10.1016/j.str.2018.05.007

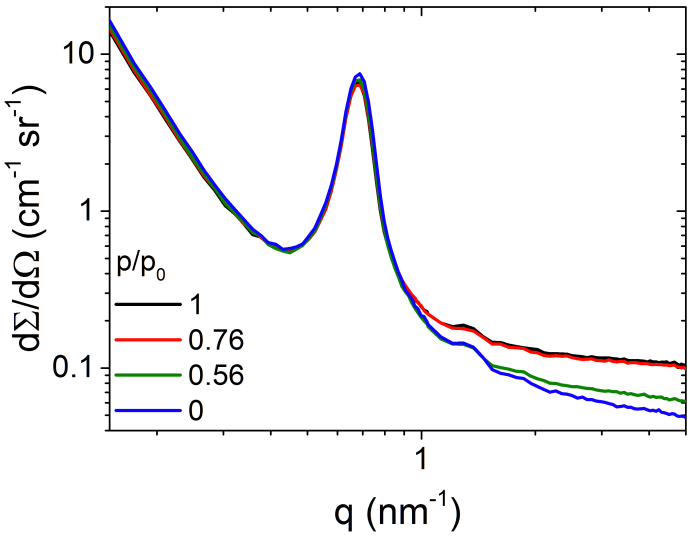
Use contrast match to mask



— J. Nitsche et al., doi:10.1038/s42003-018-0203-7

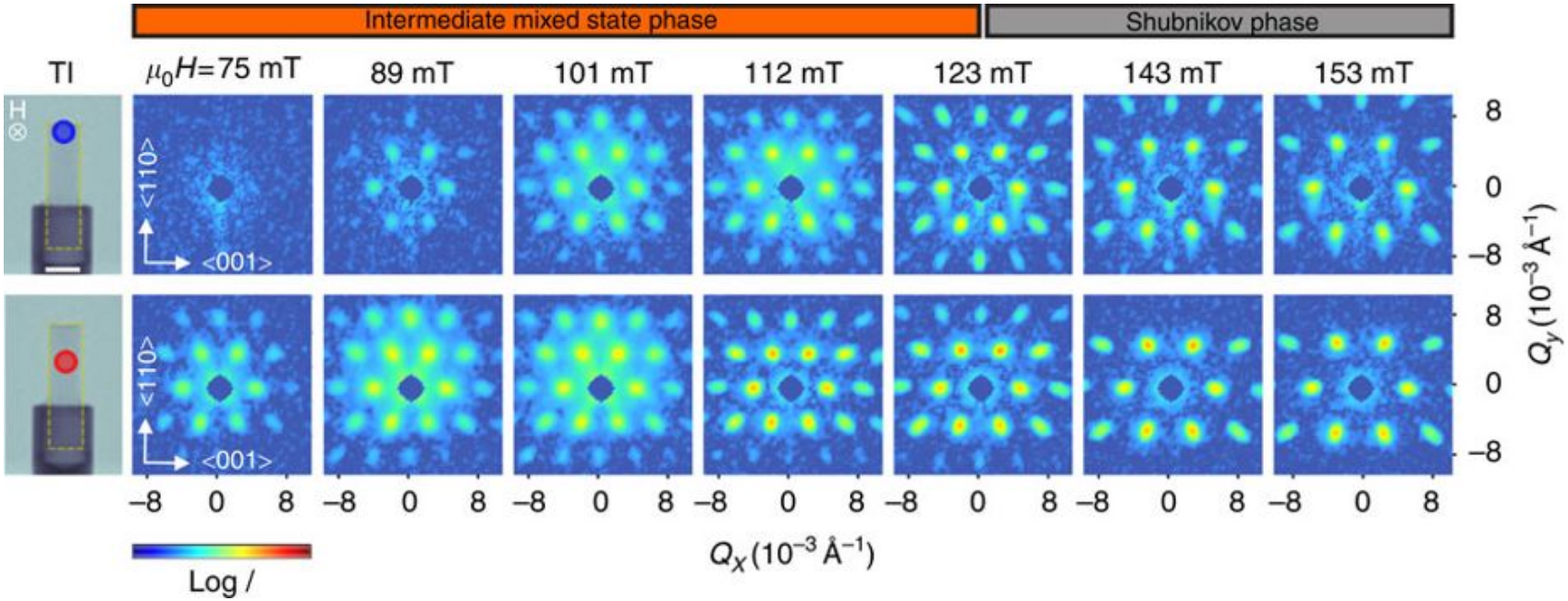
Hydration of nanoporous materials





— R. Morak et al., doi:10.1107/S1600576717012274

Vortex lattices



— T. Reimann et al., doi:10.1038/ncomms9813