SANS measurement

Results:

Scattering curve:

Fig1 presents the SANS curves of the CASP target in absolute intensity and concentration-normalised. This curve is typical of an elongated particle.

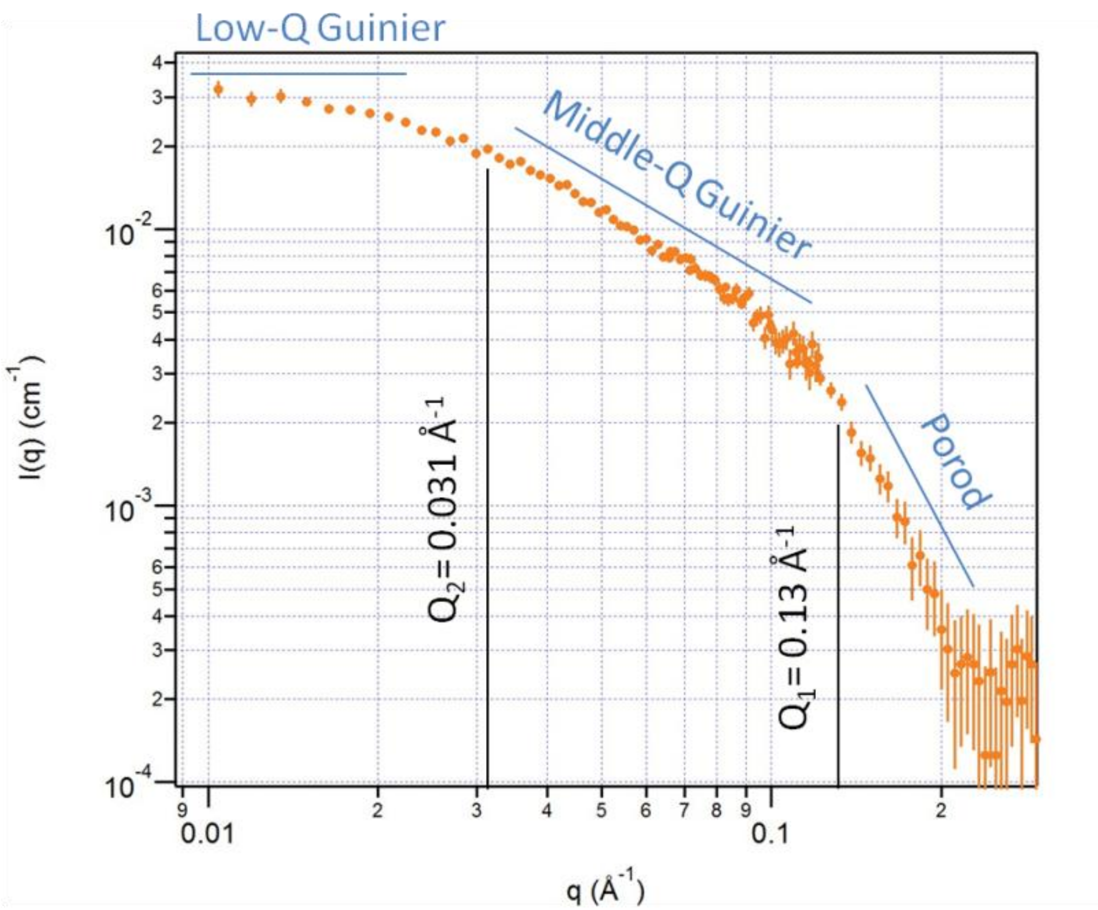

Figure 1 : SANS curve of the CASP target, in absolute units and normalised to 1mg/mL. This curve is typical of a rod-like particle.

Guinier plots:

Figure 2 presents the low-Q and middle-Q Guinier plots of these data, which suggest a **rod of about 24 Å diameter and 133 Å length**.

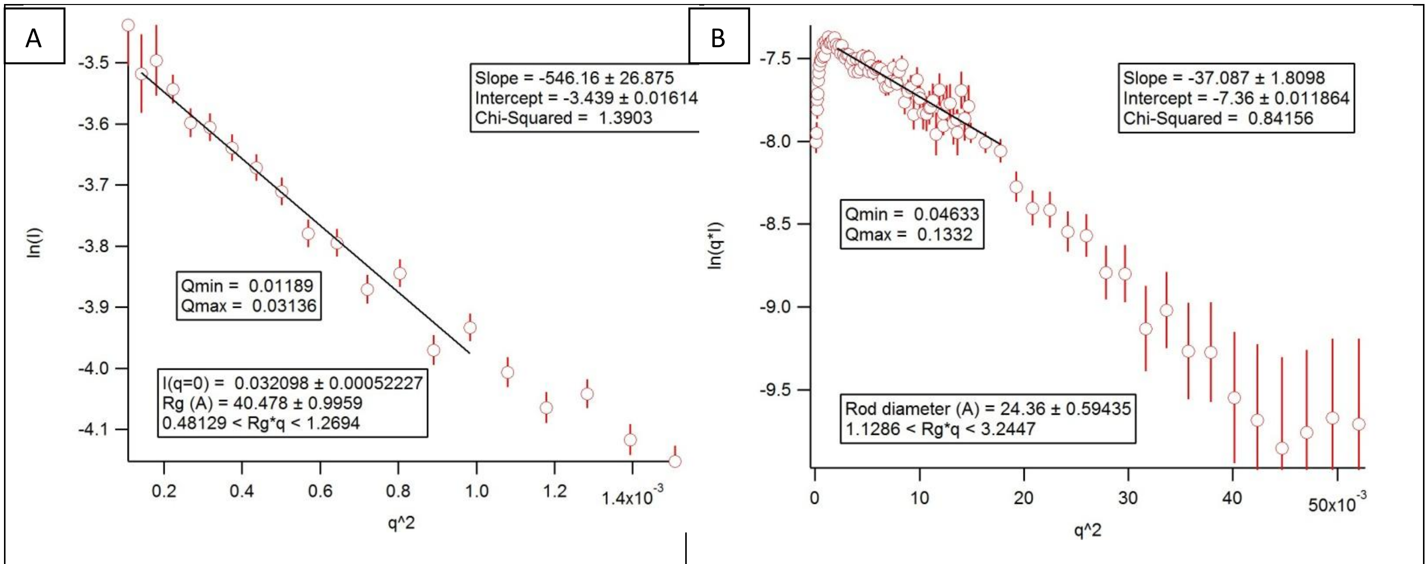

Figure 2: Low-Q (A) and middle-Q (B) guinier plots of the data.

The intensity extrapolated at Q = 0, $I_{(0)} = 0.03$, shows that the molecular weight of the protein is about **50 kDa**.

Pair distances distribution function:

The pair distance distribution function plotted on figure 3 is typical of a rod-like particle, with a diameter of 21 Å and a maximum distance of about 140 Å. This real-space representation confirms the Guinier-extracted values. Note as well a specific distance around 60 Å.

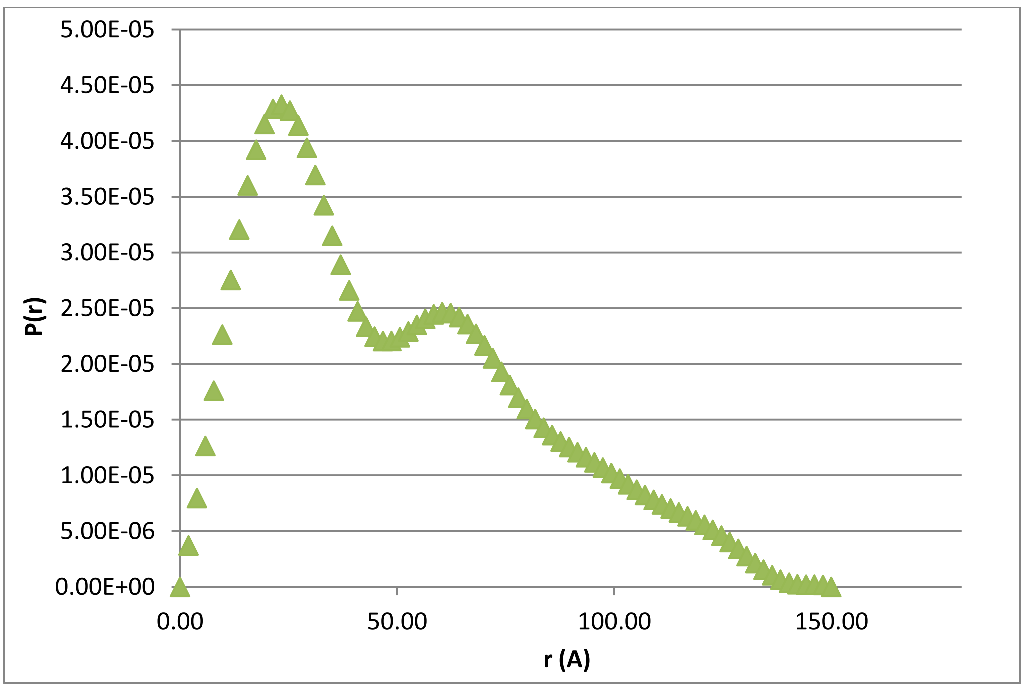

Figure 3: Pair distance distribution functions of the CASP target

Material and Method:

Sample:

Non-labelled protein in H_2O-buffer

SANS measurement configuration:

Instrument: ILL-D22

Wavelength: 6 angstrom +/- 11%

Configurations (sample-detector distance/collimation length): 1.5m/2.8m, 5.6m/5.6m and, for the large complexe, 17.6m/17.6m.

Collimation diaphragm: rectangular 40mm x 55mm

Sample aperture rectangular 7mm x 10mm

Reduction:

Using Grasp software (C Dewhurst): correction by the detector sensitivity, correction by transmission, subtraction of empty cell and blocked beam, normalization to upstream monitor counts, calibration to absolute intensity using direct measurement of flux at sample position.

Data treatment using NCNR macros for IGOR: curve merging, buffer subtraction, concentration normalization to 1mg/mL.

Theoretical background :

(adapted from SANS tool box: https://www.ncnr.nist.gov/staff/hammouda/the_SANS_toolbox.pdf)

Extraction of dimensions from Guinier plots:

Low-Q Guinier: $Rg_{LQ}^2 = L^2/12 + R^2/2$

Middle-Q Guinier : $Rg_{MQ}^2 = R^2/2$

Extraction of molecular weight from I(0):

$I_{(Q=0)} = (N/V) \times V_p^2 \times contrast^2$

(N/V) is the number density in particle/cm^3

Vp is the volume a one particle in cm^3

Contrast is the difference between particle and solvent SLD

$SLD_{H2O} = -0.554 \times 10^{10}\ cm^{-2}$;

$SLD_{\text{h-protein}} = 2.1 \times 10^{10}\ cm^{-2}$

Equivalences:

$(N/V) = N_A \times C_M / 1000$

N_A is avogadro number (mol^{-1}) ; $N_A = 6.022 \times 10^{23}\ mol^{-1}$

C_M is molar concentration (mol/L)

$C_M = C_{mass} / MW$

C_{mass} is mass concentration (mg/mL); 1mg/mL for normalized data

MW is the molecular weight (g/mol)

$(N/V) = N_A \times C_{mass} / (1000 \times MW)$

$V_p = MW / (N_A \times d)$

d is the specific mass density (g/cm^3); d of protein is 1.4 g/cm^3

$MW = (I_{(0)}/contrast^2) \times 1000 \times d^2 \times N_A / C_{mass}$