SUPPORTING INFORMATION

The GISAXS results have been corrected by different treatments considering refraction and absorption effects of the X-ray beam all along its pathway. We demonstrate in this annex that a correct extraction of the data requires such levels of treatment. Assuming that the altered layer was made of non interacting hard spheres, a theoretical image has been calculated taking into account all the contributions (refraction and absorption). Then a series of treatments omitting the refraction treatment then the refraction and absorption treatments have been performed on the simulated images in order to give back corrupted P(q). These wrong radial average diagrams are shown in Figure 1 together with the correct P(q) of the initial spheres. If one does not include absorption effects nor refraction effects (which are both exit angle dependent) the exact shape of the object is not correctly resumed. Nevertheless, it is clear that in a real case where the solution is not known a priori the distinction between a false treatment and a slightly different size (for instance as the minimum is shifted) is difficult to appreciate. This shows the limits and difficulties of the method for such a non organized and non monodisperse system as the ones under study.

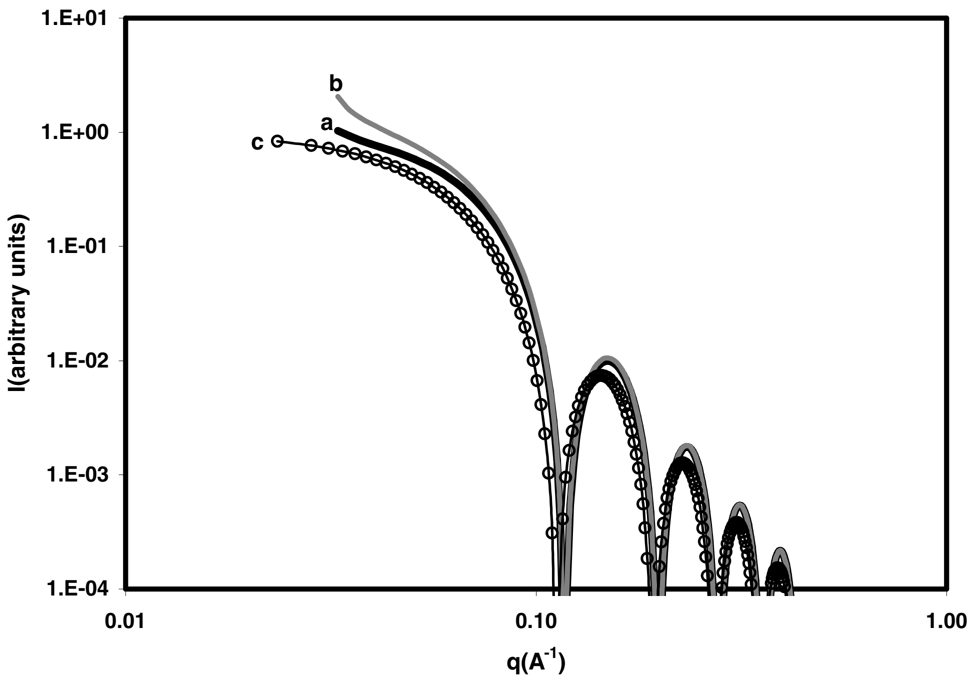

Figure 1: Radial averages including step by step the different effects. The P(q) of a pure sphere has been taken as the exact solution (curve c)to be retrieved. Curve a: taking no correction into account; curve b: taking only absorption into account ; curve c: taking absorption and refraction into account.

As a matter of fact, taking a typical altered layer of thickness 500nm with a pore volume fraction of 0.3 leads to a $\Delta\mu$ (at 27keV) of 4cm^{-1} (the present glasses have a lineic absorption coefficient of 6cm^{-1} at 27keV). In that case, q=0.1A^{-1}, the ratio z_{eff}/z is around 0.81 for an incident angle of 0.04° and 0.89 for an incident angle of 0.08°. These levels of error propagate to the final results when absorption is not taken into account.

A last point which deserves a general comment is the sensitivity of the experiment to a potential gradient of structure. Simulations of the scattering cross sections of the sample for two different incident angles have been performed for an altered layer made of two layers with equal thickness (250nm), equal volume fraction but pore radius different (6nm for the surface layer, 2nm for the buried layer). The simulations are shown in Figure 2. The similarity of the results allows to conclude that there is no hope to measure that sort of gradient in the present system at this beam energy. Accordingly, in the results section the absence of influence of incident angle was tested in order to check that the whole procedure of scaling was correct.

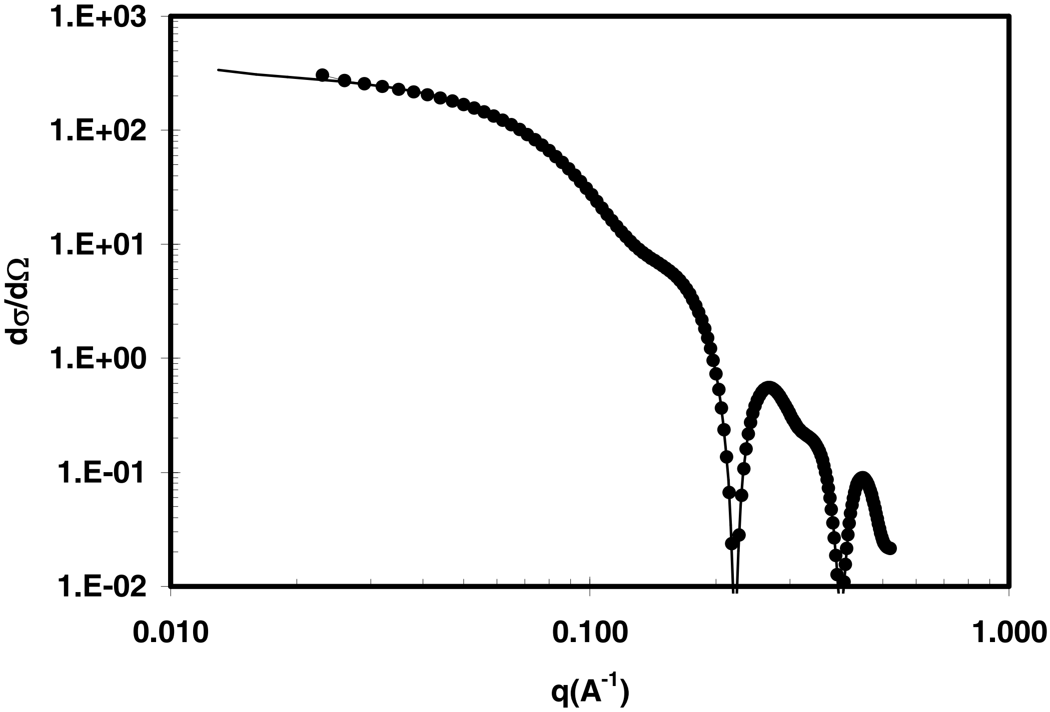

Figure 2. Influence of the incident angle of the scattering at two different angles 0.04° (line) and 0.08° (points) when the layer is made of two layers with equal thickness, equal volume fraction but pore radius different by a factor of three.