A Simple Sample As Analyzed by ***Parratt32***

The following example shows data from neutron and x-ray reflectivity measurements. It is taken from a research project on the adsorption behaviour of amphiphilic molecules on chemically modified silicon surfaces from aqueous solutions.
As a first step the silicon substrates were treated with a solution containing n–Octadecyl–trichloro–silane (OTS). After this procedure the silicon is covered with a hydrophobic layer of densely packed C_{18}–chains. According to literature the thickness of this layer is $d = 24.2$ Å.
The data from the measurements was analyzed by Parratt's recursion algorhithm (The Parratt32 programme). The table shows the resulting thicknesses, scattering length densities (values for neutrons in parantheses) and roughnesses of the respective layers.

material	thickness Å	scattering length density 10^{-6} Å^{-2}	roughness Å
air	—	0	—
C_{18}	20.8	7.6 (0.2)	5
SiO_2[a]	8.69 (11.3)	14.3 (3.47)	1
Si	—	20.12 (2.073)	1

[a]for x–rays the scattering lengthes for SiO_2 and Si are indistinguishable ($20.15 \times 10^{-6} : 20.12 \times 10^{-6}$), the value found here for the SiO_2–layer leads to the conclusion that some of the OTS penetrates into this oxide layer.

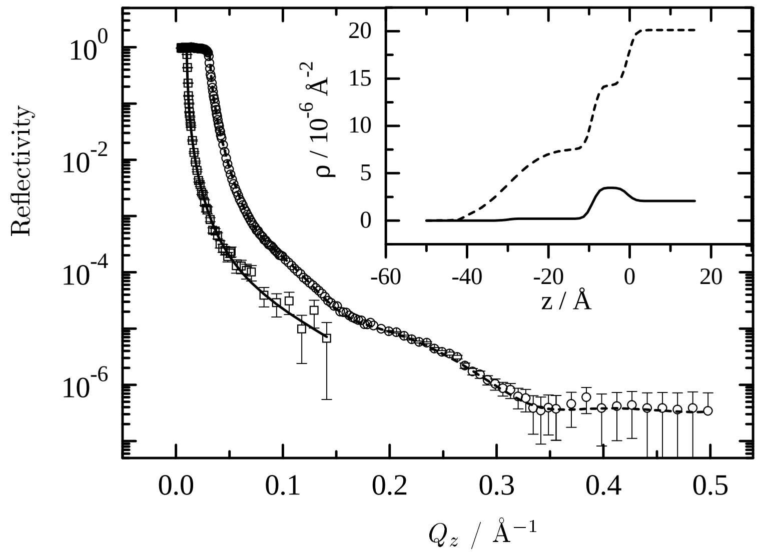

Figure 1: Neutron– and X–ray reflectivity of an OTS treated silicon wafer: 4.66 Å neutrons (□) with fit (—), Cu-K$_\alpha$ X–rays (○) with fit (– –). The inset shows the scattering length density profile across the intefacial region (— : neutrons, – – : x–rays). The Si/SiO_2 interface is chosen to $z = 0$. Since the maximum momentum transfer in the neutron measurement is somewhat low due to considerably lower intensities, the density profile cannot be determined with the same accuracy as from the x–ray measurement.