Brain teaser #2: "A good reason to measure reference foils at the beginning of beamtime"

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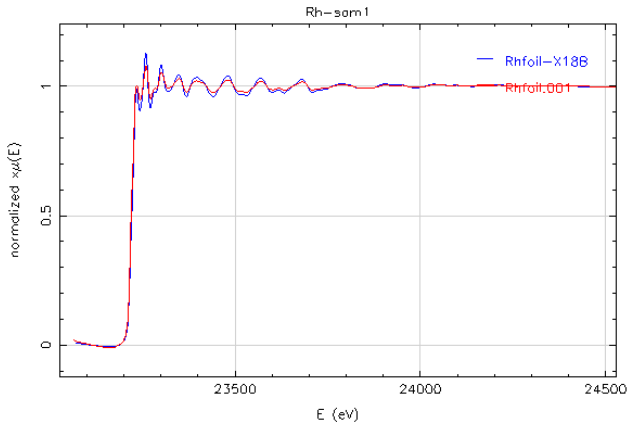
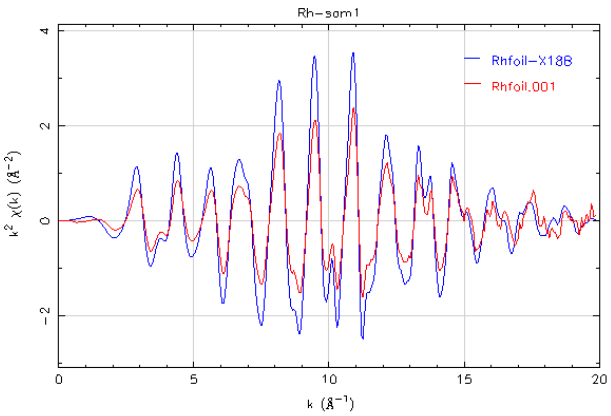
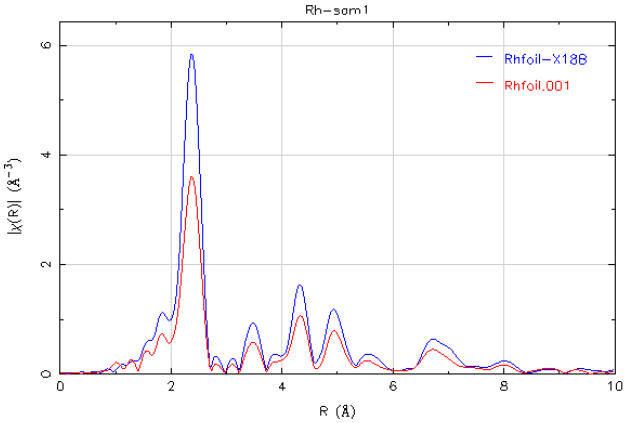
This is a short story, with a puzzling problem that took some time to solve. It is a nice example why measuring reference foils before the beginning of the beamtime is important.

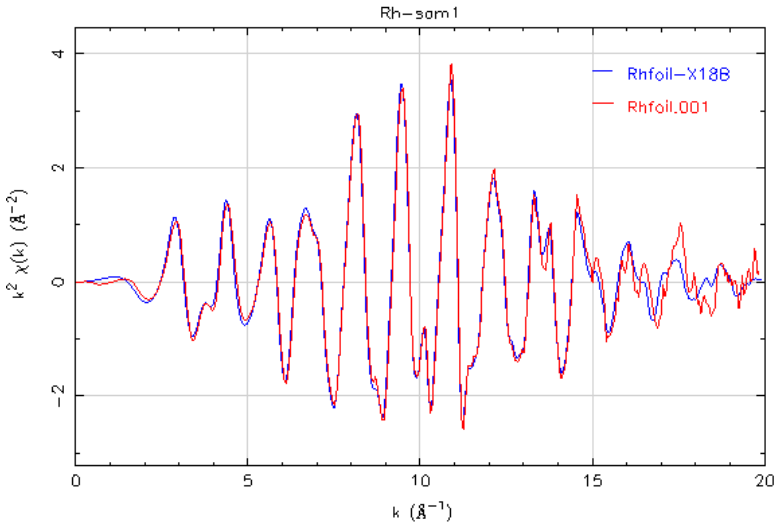
Here is the story. Rh K edge EXAFS was measured in a standard, good quality, Rh foil (25 micron) and compared with the data measured at the same foil earlier (Rhfoil-X18B). The comparison in energy, k-space and r-space is shown below.

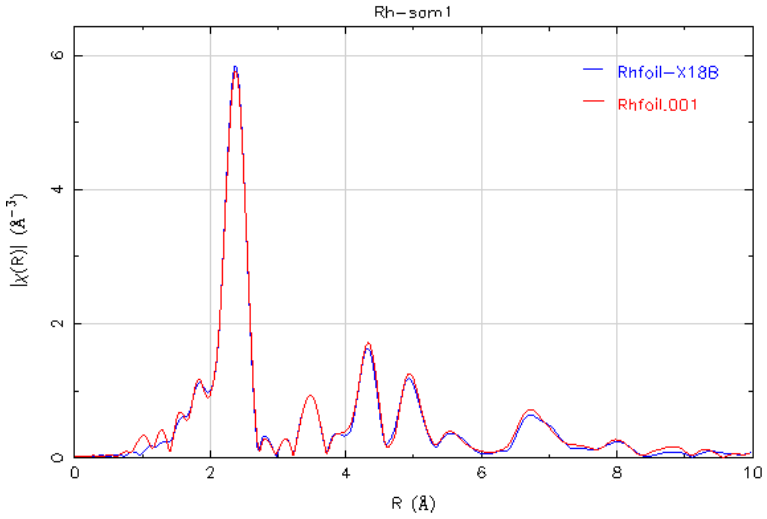






It appeared that the data can be made very similar in k-space and r-space by applying a scaling factor of approximately 1.6 to chi(k):





One possible explanation is that the white beam vertical slit separation was too large and the energy resolution in this experiment was worse than in the standard measurement (the beamline does not have a collimating mirror). However, that was not the case. There was another, more exotic reason, related to the beamline optics, for such discrepancy, which disappeared after the problem was fixed. Although that problem may not be too typical for other beamlines, it is a good educational experience that shows also why it is important to know how absorption coefficient is calculated from the incident and transmitted beam intensities. Detectors were the gas-filled ionization chambers that used proper gases for adequate measurements. What was the problem?