EUROPEAN **S**YNCHROTRON **R**ADIATION **F**ACILITY

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ESRF

ESRF	**Experiment title:** Adsorption of organic molecules on the muscovite mica mineral surface	**Experiment number**: HC-2913
Beamline: ID03	**Date of experiment**: from: 12-04-17 to: 18-04-17	**Date of report**: 26-07-2017
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Report:

In this study, we investigated the ability of divalent cations to bridge polar oil molecules to a negative mineral surface, which is one of the proposed mechanisms to explain the increase in oil recovery when an oil well is flooded with water of low salinity as compared to sea water. Studying the adsorption of organic molecules on muscovite mica surfaces functionalised with either monovalent or divalent cations, is a way to proof the presence of a bridging effect of divalent cations.

Full data sets were measured for K and Ca functionalised muscovite in contact with stearic acid (in methanol and decane). It appears that stearic acid does not adsorb strongly to either K or Ca muscovite. However, subtle changes in the measured crystal truncation rods for the different conditions might show up during data analyses, which is still ongoing.
When calcite ($CaCO_3$) was chosen as a substrate to check our methodology, it clearly shows that stearic acid adsorbs at the surface when brought in contact with stearic acid in methanol, see figure 1.

Successful measurements were also performed for K and Ca functionalised muscovite in contact with hexanoic acid, hexanol, hexylamine and hexane. Depending on the functional group of these molecules, the interface structure will be different. In the measured crystal truncation rods differences were observed for different hexane derivatives *and* for different functionalisations. When the full data analysis is completed, conclusions about the surface structure can be drawn. It is already clear that the two minerals, calcite and muscovite mica, behave quite differently.

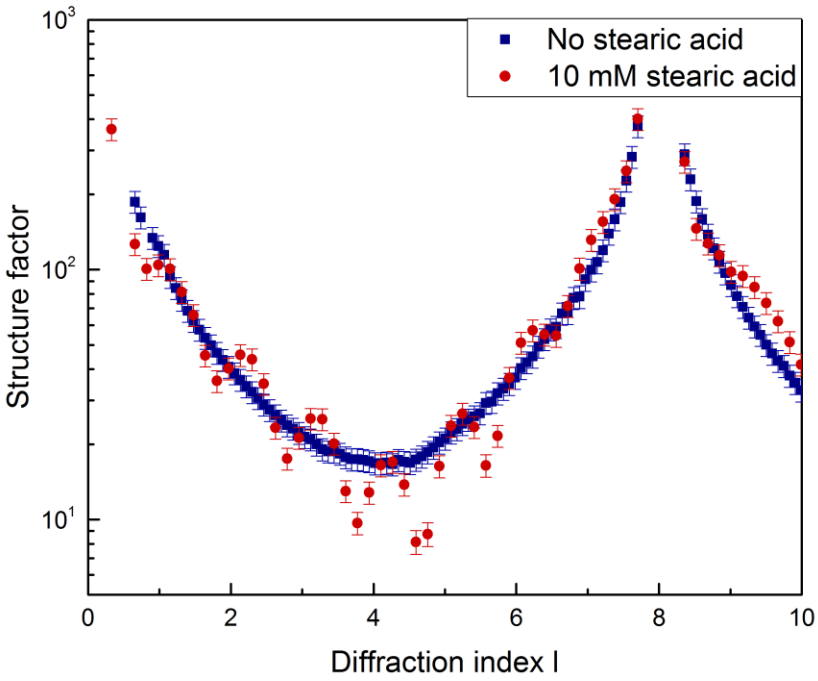

Figure 1: The measured specular crystal truncation rods for calcite in water (blue dots) and calcite in contact with a 10 mM stearic acid solution in methanol (red dots). Stearic acid adsorbs at the calcite surface, which can clearly be seen from the oscillations corresponding to the layer thickness. This is in agreement with literature (Fenter and Sturchio, 1999).