	Experiment title: The structure of (R,R) Tartaric Acid on Cu(110).	**Experiment number**: **26-02-119**
Beamline: BM26	**Date(s) of experiment**: From: 07.05.2002 To: 14.05.2002	**Date of report**: 21-08-2002
Shifts: 21	**Local contact(s)**: Igor Dolbnya	
Names and affiliations of applicants (* indicates experimentalists): **J. Arsic*, D. Kaminski*, P. Poodt*, V. Humblot* and E. Vlieg***		

Report: (max. 2 pages)

The increasing demand of the chemical and pharmaceutical industries for enantiomerically pure compounds has spurred the development of a range of so-called 'chiral technologies', which aim to exert the ultimate control over a chemical reaction by directing its enantioselectivity. Heterogeneous enantioselective catalysis is particularly attractive because it allows the production and ready separation of large quantities of chiral molecules onto catalytically active surfaces.

A mimic of one such catalyst is formed by adsorbing (R,R) tartaric acid (TA) molecules on Cu(110) surfaces: this generates a variety of surface phases, of which only one is potentially catalytically active. Using LEED and STM, it was found that this active phase consists of extended supramolecular assemblies of adsorbed (R,R)-tartaric acid [1]. The adsorbed assemblies create chiral channels, exposing bare metal atoms. In this way, a non-chiral metal surface can be turned into an enatioselective catalyst. The LEED and STM data show that the domains are highly ordered, and that the surface unit cell of the adsorbed layer contains three molecules.

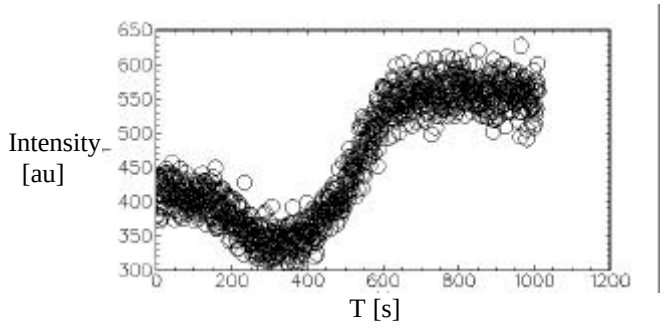

Fig. 1 (0 0 1.4) surface reflection during deposition. Strong effect of deposited TA.

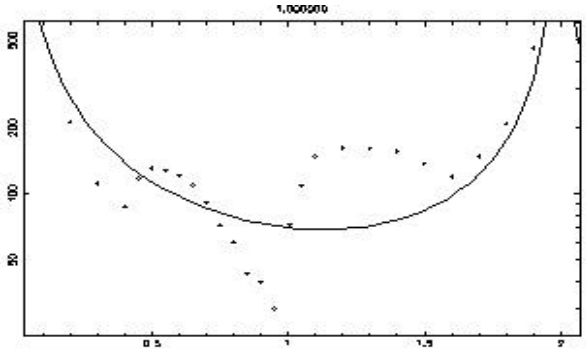

Fig. 2 Specular reflectivity data (circles) together with the curve calculated from bulk terminated Cu(110). The data clearly show that the deposition of TA has a big effect on the surface structure.

The aim of this project is to determine the surface structure of TA on Cu(110). We used our UHV chamber EXODUS together with a newly built, differentially pumped TA doser. Sub-monolayers of TA are easily formed on the surface, figure 1 shows the intensity during a deposition.

Data acquisition was quite difficult, because the Cu(110) substrate showed more graininess than expected. Several preparation cycles did not yield any improvement in this. Nevertheless, we collected two data sets for two different depositions, both consisting of more than 120 non-equivalent reflections. The first analysis for the data from the full deposition case shows that the specular reflectivity exhibits a remarkably strong modulation (see figure 2), while the effect of TA on the other rods is much weaker. It is clear that we are able to obtain useful data on this system.

TA can form several ordered reconstructions on Cu(110). The initial analysis shows that three of these, the (9,0,1,2), (4,1,2,3) and (4,0,2,1) (all in matrix notation), give reasonable fits to the data. The (9,0,1,2) reconstruction is the one we are interested in; this is shown in figure 3. We were, unfortunately, not able to measure any fractional-order reflections from our samples. The analysis is in progress, but it is clear that a larger data set, including a larger range of perpendicular momentum transfer and (hopefully) fractional-order reflections, is important to derive the detailed structure and to establish whether the Cu(110) substrate adapts a chiral structure.

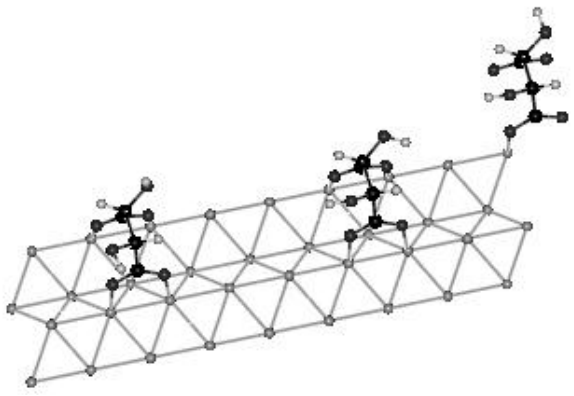

Fig. 3. Model of the expected [9012] –reconstruction.

[1] M. Ortega Lorenzo, C.J. Baddeley, C. Muryn and R. Raval, Nature 404 (2000) 376.

[2] M. Ortega Lorenzo, S. Haq, T. Bertrams, P. Murray, R. Raval and C.J. Baddeley, J. Phys. Chem. B 103 (1999) 10661.

[3] L. Antonio, M.M. Barbosa, P. Sautet, J. Am. Chem. Soc. 123 (2001) 6639.