



	Experiment title: The structure of liquid Sn on Ge(111)	Experiment number: Si 605
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Names and affiliations of applicants (* indicates experimentalists): M.F. Reedijk*, J. Arsic*, J. Bootsma*, E. Vlieg* RIM dept. of Solid State Chemistry University of Nijmegen 6525 ED Nijmegen The Netherlands		

Report:

This experiment concentrated on the liquid structure of a monolayer Sn deposited on Ge (111). This system has a solid-liquid transition near 170°C. Below the transition the Sn layer is reconstructed. Previous experiments on this system have shown that above the transition the Sn-layer has both liquid and solid properties. These properties change with temperature. The solid properties were well characterized in the previous experiment. The aim of the present experiment was to fully characterize the liquid properties of the Sn layers.

The experiments are performed with a Germanium (111) crystal on which we deposited 1.3 monolayers of Sn with a Knudsen cell, the exact amount is determined using specular reflectivity.

There are two ways of characterizing the liquid structure. The first consists of measuring the normal crystal truncation rods of the substrate. The liquid at the interface will contain small density modulations with the substrate periodicity and will thus contribute to the diffraction signal. This has extensively been done in the previous experiment, of which the results have been submitted for publication[1]. The second characterization method is to directly measure the diffuse scattering from the liquid. A two-dimensional liquid Sn layer gives rise to cylindrical shells of diffuse scattering, from which the pair-correlation function can be deduced. The influence of the germanium surface on the liquid Sn layer should appear in a modulation of the liquid ring. This liquid ring was observed in the previous experiment, however the 2D character was not proven beyond any doubt and the modulation of this ring couldn't be measured. Therefore this experiment has a dual goal, first to prove the 2D-character of the Sn-liquid, second to observe the modulation of the liquid ring.

Figure 1 shows the position of the liquid ring at different perpendicular momentum transfer. The diffuse scattering for bulk liquid Sn forms a sphere in reciprocal space, the diffuse scattering of the monolayer liquid forms a cylinder. This proves the 2D-character of the monolayer liquid.

The second goal of this experiment, the modulation of the liquid ring, couldn't be achieved. This was due to several problems with the equipment. The main problems concerned the sample heating and the water cooling hoses. It turned out to be necessary to bake out the ultra high vacuum chamber during the run.

Thus, this experiment confirmed the liquid like character of the Sn layer above the phase transition and proved that the liquid layer was two-dimensional. The modulation of the diffuse scattering has not been observed.

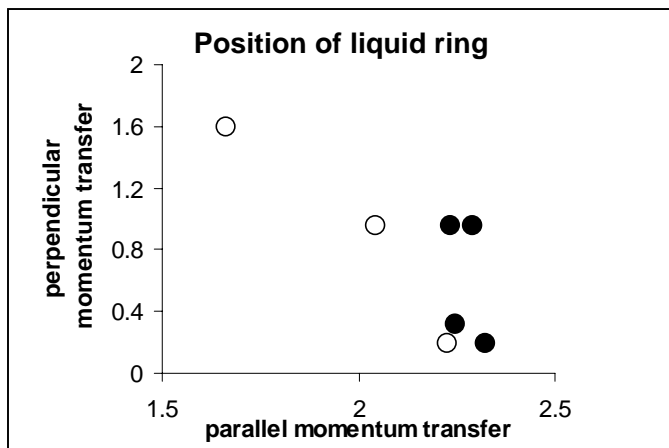


Figure 1 The position of the liquid ring at different perpendicular momentum transfer for bulk liquid Sn, open circles, and a monolayer liquid Sn, filled circles.

[1] M.F. Reedijk, J. Arsic, F.K. de Theije, M.T. McBride, K.F. Peters and E. Vlieg *'The structure of liquid Sn on Ge(111)'*, submitted for publication.