X-Ray Specular Reflectivity Studies of Helium Films	X22B

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The interface between liquid helium, a quantum liquid, and its vapor, is of considerable interest both theoretically and experimentally. X-Ray specular reflectivity provides Angstrom-level resolution to the density profile of such interface. In studying thin films, one can extract both the intrinsic width of the interface as well as the contribution of capillary waves. By studying undersaturated films, we were able to vary film thickness from 20$\AA$ to 200$\AA$. Capillary waves are suppressed for thinner films. Temperature dependence of the interface width allows one to separate contributions to the interface width of thermally excited capillary waves and the zero-point waves present at 0K At lower temperatures, zero-point energy capillary waves dominate, whereas at T>.7K the contribution of thermally excited capillary waves becomes important.

We attempted a similar study in ^{3}He and in ^{3}He/^{4}He mixtures. A thinning effect that we observed earlier could now be quantified. It appears that the extent of thinning scales proportionally to the X-Ray intensity and the amount of ^{3}He disolved in the film.

Data analysis of both experiments is still in progress.

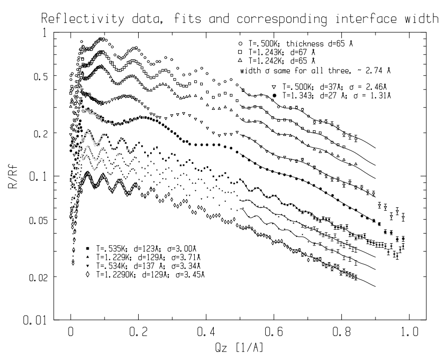

Figure 1. Thickness (d) and temperature (T) dependence of density profile width (σ) for ^{4}He films.

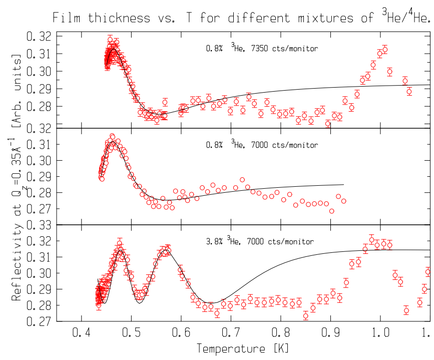

Figure 2. Thinning of ^{3}He/^{4}He mixture films as a function of temperature for different content of ^{3}He. At lower temperatures, more ^{3}He condenses into the liquid phase but the films thickness *decreases.* Thickness changes at higher T are due to condensing ^{4}He. Lines are fits to a model where extent of thinning is proportional to ^{3}He content in the film.