

Schrenk, König, and Pobell Reply: In their Comment, Adams *et al.* [1] claim that the results on the nuclear magnetic ordering of ^3He clusters in a solid ^4He matrix reported by Schrenk *et al.* [2] can be understood as a result of surface nucleation, hysteresis between melting and freezing, and incomplete melting of ^3He in confined geometries. In this Reply we will show that the fact that we have *simultaneously* monitored the pressure of the sample while taking heat capacity data [2] provides clear experimental evidence that the interpretation given by Adams *et al.* can be ruled out as a possible explanation of our results. We want to emphasize that the origin for the existence of solid ^3He in the droplets at pressures far below the bulk ^3He melting curve is still unknown to us.

Adams *et al.* argue that ^3He in the droplets nucleates on the ^4He surface similar to the nucleation of ^4He on Grafoil [3] or ^3He on Grafoil precoated with ^4He [4], leading to a decreasing density gradient in the ^3He droplets from the ^4He - ^3He interface to the core of the droplets where at a pressure below the bulk ^3He melting curve ^3He should then be in the liquid state. Consequently, this density gradient has to result in a *continuous* freezing of ^3He during the warm-up of the sample from the minimum temperature to the bulk ^3He melting curve which, however, was not observed in our measurements. In our experiment, freezing (or melting) of ^3He in the droplets can be detected to a high accuracy by measuring the pressure changes in the sample. This enables us to monitor pressure changes of $\Delta p = 0.3$ mbar corresponding to the melting (or freezing) of about 0.1% of the total amount of ^3He in the droplets.

We have observed at, e.g., $p = 33.6$ bars a *constant* pressure (to within our experimental resolution) during the warm-up of the sample at temperatures below ~ 8 mK. At this temperature a significant decrease in pressure of about 30 mbar indicates the solidification of the liquid fraction of the ^3He in the droplets (see Fig. 2 in Ref. [2]). Subsequent cooling of the sample again shows that the same amount of ^3He melts *without any hysteresis* between freezing and melting. We observe a shift of the melting (or freezing) curve of the liquid part of the separated ^3He towards lower temperatures compared with bulk ^3He , but there is no sign of density gradients in the ^3He droplets as expected from substrate nucleation.

We can apply the same arguments to exclude the explanation for the history-dependent ordering temperature given by Adams *et al.* [1]. They explained the history dependence of the specific heat with hysteresis in melting

and freezing of the ^3He separated in the droplets. As already mentioned above, melting (freezing) of ^3He results in a pressure increase (decrease which, however, was not observed during the investigation of the history-dependent part of the specific heat. Moreover, at $p = 36.4$ bars, i.e. at a pressure which is 2 bars above the bulk ^3He melting curve and at which clearly only solid ^3He should be present in the droplets, the specific heat shows the similar history dependence as observed at all other (lower) pressures investigated.

Furthermore, Adams *et al.* claim that the appropriate variable to describe magnetic interaction was the density of the ^3He droplets rather than the pressure of the sample [1] which in our experiment is indicated by a capacitance strain gauge. The magnitude of the magnetic interaction and therefore the ordering temperature of solid ^3He is determined by the density of the sample. Higher density leads to a lower ordering temperature [5]. In our experiment [2] we have observed nuclear magnetic ordering of solid ^3He in the droplets at even *higher* temperatures (and lower pressures) than observed in bulk ^3He . We therefore conclude (1) that there must be solid ^3He in the droplets at lower density than the density of bulk solid ^3He at the melting curve, and (2) that the reason for solid ^3He at a pressure below the bulk ^3He melting curve is not a density increase in the ^3He droplets caused by the interface to the ^4He matrix, as in this case the highest ordering temperature to expect would be 0.93 mK [5], which is the ordering temperature of bulk ^3He at the melting curve.

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