

## Erratum: Heat Capacity Peak in Solid $^4\text{He}$ : Effects of Disorder and $^3\text{He}$ Impurities [Phys. Rev. Lett. 102, 125302 (2009)]

X. Lin, A. C. Clark, Z. G. Cheng, and M. H. W. Chan  
(Received 29 November 2009; published 16 December 2009)

DOI: 10.1103/PhysRevLett.103.259903

PACS numbers: 67.80.-s, 05.70.-a, 61.72.-y, 99.10.Cd

In a recent Letter (Phys. Rev. Lett. **102**, 125302 (2009)) we reported low temperature heat capacity measurements on solid helium samples of different crystallinity. Measurements were made on samples solidified using the blocked capillary method (BC). We also attempted to grow a solid sample at a constant pressure (CP) of 38 bar by keeping the capillary open with liquid during solidification. Upon more careful examination of the data, specifically the  $T^3$  temperature dependence above 120 mK, it is clear that the labeling of the data shown in Fig. 1(b) as that of a 38 bar CP sample cannot be correct. It appears upon cooling the sample for measurements below 300 mK, helium migrated back into the capillary, thus lowering the density and pressure. This ultimately resulted in a solid-liquid coexistence sample. If we use 26 K as the Debye temperature [1] of solid  $^4\text{He}$  at 25 bar, the melting line pressure, the specific heat of the sample above 120 mK together with the specific heat of liquid helium at 25 bar allows us to conclude that the sample has a solid fraction of  $32 \pm 2\%$  by volume.

Additionally, the correct solid fraction of the other S-L coexistence sample [previously shown in panel (c) Fig. 1] is  $39 \pm 2\%$ . The origin of the error stems from the fact that this solid fraction contributes about 75% to the total heat capacity. These mistakes necessitate changes in Fig. 1 and 2. The modified figures are shown below. The excess entropies obtained from integrating over the specific heat peaks in Fig. 2 are 13.3 and  $7.9 \mu\text{J mol}^{-1} \text{K}^{-1}$  for the 32% and 39% solid, respectively. The excess specific heat and entropy of the S-L samples imply that the pressure of the melting line differs from a pure  $T^4$  dependence. For both samples, the calculated melting curve pressure deviates by approximately  $\pm 0.5 \mu\text{bar}$  from the best fit of  $T^4$ .

We wish to note that these corrections do not alter the conclusions of the Letter, namely, that the position and height of the specific heat peak decrease with increasing quality of the solid sample and that the peak is found even in solid samples in coexistence with liquid.

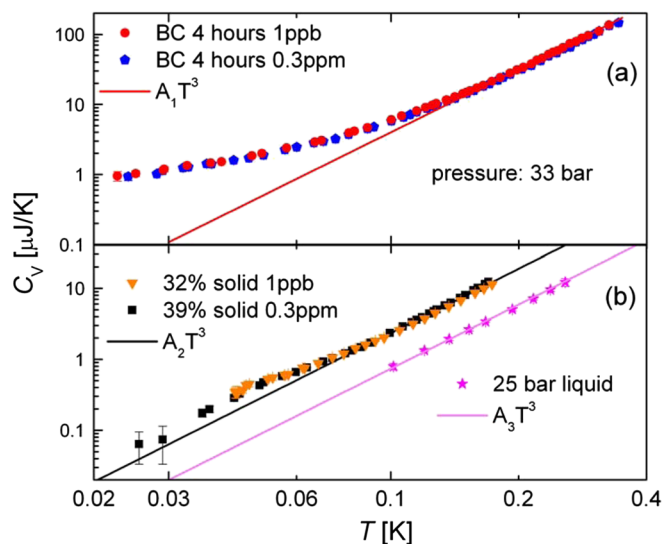


FIG. 1 (color online). From top to bottom, the heat capacity data of (a) BC  $^4\text{He}$  samples (4 h growth time) with  $^3\text{He}$  concentration ( $x_3$ ) of one part per billion (1 ppb) shown as red circles and 0.3 ppm shown as blue pentagons, (b) solid-liquid coexistence with  $x_3 = 1$  ppb (orange triangles) and 0.3 ppm (black squares), and a 25 bar liquid sample with  $x_3 = 1$  ppb (pink stars). The density of the two solid samples is  $20.46 \text{ cm}^3 \text{ mol}^{-1}$ . The measurement uncertainty, unless shown otherwise, is less than or equal to the size of the symbols. The volume of the calorimeter is  $0.93 \text{ cm}^3$ .

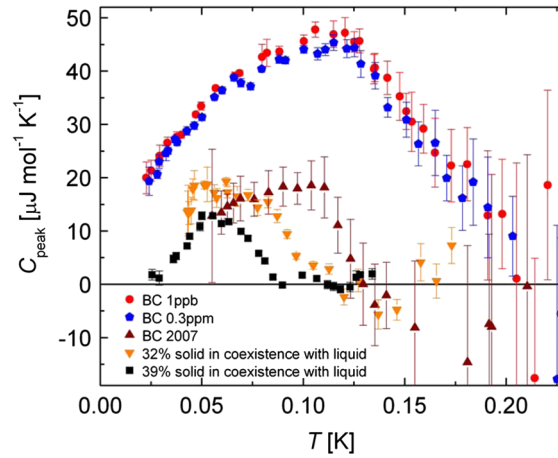


FIG. 2 (color online). Specific heat peak as a function of temperature for solid  $^4\text{He}$  samples grown under different conditions. From top to bottom: (1) BC  $^4\text{He}$  samples, 4 h growth time with  $x_3 = 1$  ppb (red circles), and 0.3 ppm (blue pentagons); (2) BC  $^4\text{He}$  sample, 20 h growth time with  $x_3 = 1$  ppb (brown triangles) [2]; (3) S-L coexistence, 32% solid–68% liquid with  $x_3 = 1$  ppb (orange triangles); and (4) 39% solid–61% liquid, with  $x_3 = 0.3$  ppm (black squares). The data at higher temperature have larger scatter because the uncertainty scales with the total measured  $C_V$ .

We thank Jung-jung Su and Matthias Graf for pointing out the mistakes.

- [1] W. R. Gardner, J. K. Hoffer, and N. E. Phillips, *Phys. Rev. A* **7**, 1029 (1973).
- [2] X. Lin, A. C. Clark, and M. H. W. Chan, *Nature (London)* **449**, 1025 (2007).