Erratum: ^{4}He Desorption from Single Wall Carbon Nanotube Bundles: A One-Dimensional Adsorbate [Phys. Rev. Lett. 82, 5305 (1999)]

W. Teizer, R. B. Hallock, E. Dujardin, and T. W. Ebbesen

We have discovered an error in the temperature calibration for $T < 20$ K for the thermometer used in our Letter on adsorption to single wall carbon nanotube (SWCN) bundles. The reported amount of desorbed ^{4}He is not affected. Use of a correct calibration considerably reduces the value of the binding energy, but does not affect our conclusion that adsorption to such bundles is unexplained by two-dimensional adsorption and appears to be an example of one-dimensional adsorption.

Figures 1 and 2 here replace Figs. 2 and 3 in the original manuscript. The calibration error does not affect the amount of desorbed ^{4}He. Thus, in the figures, the amounts of desorbed ^{4}He are the same, but the temperatures have been corrected. The observed desorption amount is more than 3 orders of magnitude greater than the desorption expected for a 2D adsorbate, and thus it remains necessary to seek an alternate explanation for the observed desorption. Use of a one-dimensional model as used previously now results in a best estimate for the binding energy $\varepsilon = 230$ K rather than the $\varepsilon = 330$ K originally reported. This number agrees less well with the prediction [1] for 1D interstitial adsorption, and is above the value $\varepsilon = 210$ K predicted for adsorption along the interior axis of a nanotube. Although the sample purification procedure retains most of the closed carbon nanotubes intact, the nitric acid used probably reacts with the outermost nanotubes of some bundles and possibly with the end caps of some nanotubes. The process might thus leave a very small fraction of tubes opened at their tips or on their side. It is possible that this binding energy may be a combination of binding to the interstitials with a contribution from the interior axes of open nanotubes. But, given the preparation procedure, we expect that the predominant adsorption is via the interstitials, suggesting that the binding energy there is lower than theoretical estimates. The substantial deviation from predictions for the integrated desorption at higher temperatures is enhanced and remains unexplained.

We thank Yung Ho Kahng, who is currently extending these measurements, for bringing the incorrect calibration to our attention and for obtaining the data necessary to properly correct the calibration.

[1] G. Stan, V. H. Crespi, M. W. Cole, and M. Boninsegni, J. Low Temp. Phys. **113**, 447 (1998); G. Stan and M. W. Cole, Surf. Sci. **395**, 280 (1998).

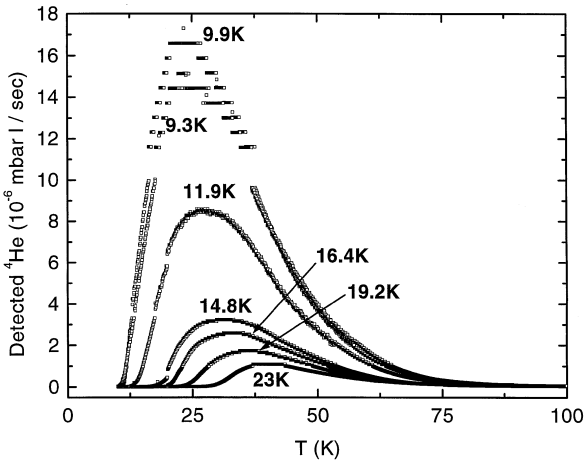

FIG. 1. Comparison of ^{4}He desorption versus temperature for sample exposure to ^{4}He at several low temperature pump-out temperatures T_{low} from Fig. 2 of the original paper, with the temperatures corrected.

 0031-9007/00/84(8)/1844(2)$15.00

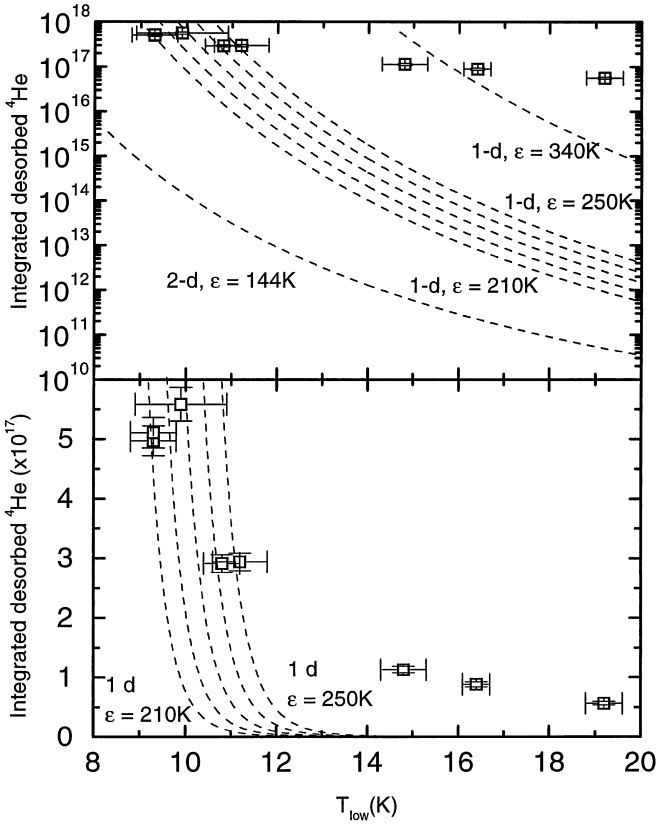

FIG. 2. Integrated desorbed ^{4}He versus T_{low} from Fig. 3 of the original paper, with a corrected temperature scale. Squares indicate the data resulting from our measurements. Theoretical calculations are shown in broken lines. 1D indicates a one-dimensional adsorbate with the noted binding energy ϵ. $\epsilon = 210$ K is the theoretically calculated binding energy for a 1D adsorbate inside the SWCNs. A family of curves for $\epsilon = 210, 220, \ldots, 250$ K is shown. $\epsilon = 340$ K is the theoretically calculated binding energy for the 1D adsorbate in the interstitial sites of the SWCN bundles. We expect little adsorption inside the individual SWCNs since the SWCN production and purification process does not preferentially remove the end caps. For comparison the theoretical calculation for a 2D adsorbate on graphite ($\epsilon = 144$ K) with the same surface area as the outer surface of the SWCN bundles is shown.