Evidence for Phasons in Potassium is Inconclusive

Recently Amarasekara and Keesom[1] (AK) have reported measurements of the specific heat of Cu and K. An unusual feature of the AK paper is the fact that the authors chose to present different methods of analysis for the two materials; the standard least-squares fit to odd powers of T for Cu and an analysis which seems to show a phason contribution in the case of K. In this Comment we point out that the K results do not seem anomalous if the same method of analysis is used for both sets of data.

In Fig. 1 we show the deviations from odd-power least-squares fits for both K and Cu. The marked similarity is suggestive of temperature-scale effects. Alternately we can analyze both sets of data following the procedure used by AK for K. The apparent phason anomalies shown in the $(C-C_0)/C_0$ plots of Fig. 2 are again similar, although the Cu data exhibit a somewhat broader peak. In addition, the electronic specific heat γ implied by this analysis for K ($\gamma = 1.83$ mJ/mole K^2 or $m^*/m = 1.10$) seems inconsistent with de Haas–van Alphen data[2] ($m^*/m = 1.26$) and recently calculated values for the band mass[3] and electron-phonon mass enhancement[4] ($m_b = 1.09$, $\lambda = 0.14$). On the other hand, if we give no weight to the AK data for $T < 0.8$ K a least-squares fit gives $\gamma = 200$ mJ/mole K^2 or $m^*/m = 1.20$.

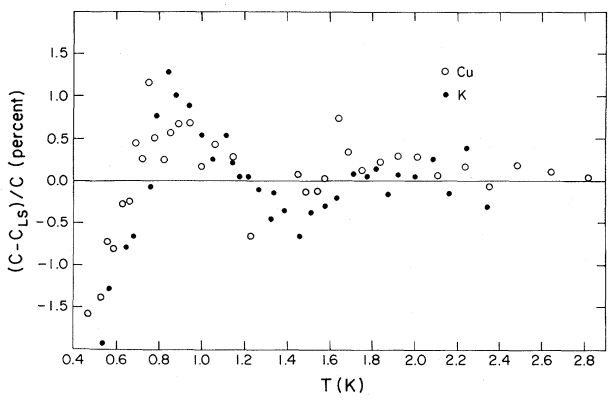

FIG. 1. The percentage deviations of the measured specific heats of Cu (open circles) and K (closed circles) from least-squares fits.

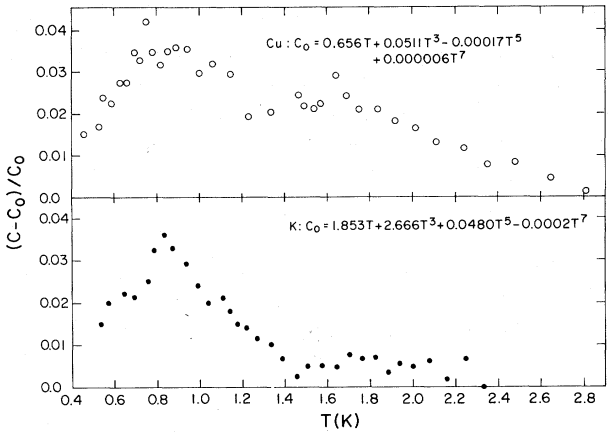

FIG. 2. The relative deviations of the measured specific heats of Cu and K from the corresponding expression for C_0.

In summary, we feel that this reexamination of the AK data shows that the evidence for phasons claimed by the authors is inconclusive.

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