Schlüter *et al.* Reply: In their Comment [1] on our recent Letter [2] about superconductivity in alkali-intercalated C_{60} (A_3C_{60}), Chakravarty, Khlebnikov, and Kivelson (CKK) raise two separate issues. They then conclude that the conventional electron-phonon mechanism, invoked by us, cannot account for the observed transition temperatures. We do not agree with their assertions and below we present counterarguments invalidating their claims.

CKK first address the question of the magnitude of μ^*, the Coulomb pseudopotential in the conventional theory of superconductivity. For C_{60} the electronic states at E_F and within about ± 10 eV of E_F are derived from C_{60} molecular carbon π orbitals. The envelope functions of these states are approximately molecular angular momentum eigenstates, with the states near E_F having mostly $l=5$ character. These molecular states are then broadened into narrow bands upon formation of the solid. In addition to these states, the (rather extended) alkali states reside within a few eV above E_F and couple to the molecular orbitals.

Traditionally, the retarded Coulomb pseudopotential μ^* is given by $\mu^* = \mu/[1+\mu \ln(\omega_c/\omega_{ph})]$, where ω_c is the high-frequency cutoff for Coulomb scattering and ω_{ph} the low-frequency cutoff for electron-phonon scattering. While the formal derivation of their Eqs. (1) and (2) is certainly correct, we disagree with CKK on their conclusion that $K^2 \ll V_c V_c'$ for A_3C_{60}, which means that interband scattering is small compared to the average intraband scattering.

For simplicity, let us assume that the individual bands of A_3C_{60} belong to different angular momenta l of the molecular envelope wave functions. Then, the scattering matrix element $V_{ll'}$ in the Cooper channel can be calculated as

$$V_{ll'} \sim \frac{e^2}{R} \frac{1}{N_l N_{l'}} \sum_{m,m'} \sum_k |c^k(lm,l'm')|^2 , \qquad (1)$$

where R is the effective radius of C_{60} and where the c^k are Gaunt coefficients. The sum over m,m' arises from averaging within bands. $V_{ll'}$ is shown in Fig. 1 as a function of l' for $l=0,3,5$. The physics of these results is simple: Dephasing of the molecular π states affects Coulomb scattering. There are some corrections due to additional crystal-field splitting. CKK's estimates correspond to nondegenerate bands.

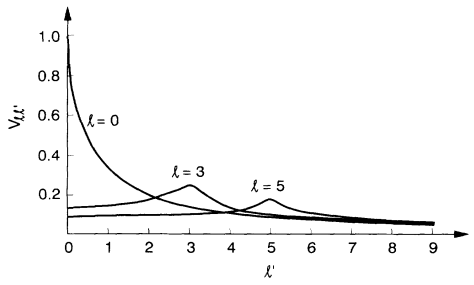

FIG. 1. Calculated interband scattering matrix elements $V_{ll'}$ [Eq. (1)] for three selected l values.

We thus conclude that Coulomb scattering in A_3C_{60} is drastically reduced due to conventional retardation effects, with the electronic bandwidth given by the overall width of the C_{60} π states, i.e., ~ 10 eV. The hybridization of higher-lying π states with alkali s states is also important since it ensures that the scattering does not remain confined to an isolated molecule. We also note that recent isotope measurements [3] are consistent with a standard $\mu^* \approx 0.2$ value.

The second issue CKK raise concerns the Landau damping of high-energy intramolecular vibrations. They argue that near $q \approx 0$, as relevant for Raman scattering, damping cannot occur because of momentum conservation. This is correct only for a single band and in the absence of any disorder. For A_3C_{60}, however, the conduction band complex contains three bands within a few tenths of an eV which are strongly affected [4–7] by orientational disorder. The electronic states in A_3C_{60} are thus unlikely to be pure Bloch states and Landau damping of Raman modes can occur. We, therefore, do not believe that the arguments given by CKK are a relevant criticism of the interpretation of the observed Raman linewidth broadening in terms of electron-phonon coupling.

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