A Magnetic Excitation Linking Quasi-1D Chevrel-Type Selenide and Arsenide Superconductors

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The quasi-one-dimensional Chevrel phases, \( A_2Mo_6Se_6 \) (\( A = \) Tl, In, K, Rb, Cs), are of interest due to their atypical electronic properties. The Tl and In analogues undergo a superconducting transition whereas the alkali metal analogues undergo metal-to-insulator transitions, neither of which is fully understood. This talk will report the results of inelastic neutron scattering on polycrystalline \( \text{In}_2\text{Mo}_6\text{Se}_6 \) (\( T_c = 2.85 \) K) and \( \text{Rb}_2\text{Mo}_6\text{Se}_6 \) (\( \text{TMIT} \sim 170\)K) which reveal a highly dispersive column of intensity present in both compounds near \( Q = 1.0 \) Å\(^{-1}\). The excitation is nearly indistinguishable from another excitation observed in the structurally related superconducting compound \( \text{K}_2\text{Cr}_3\text{As}_3 \), which has been interpreted as magnetic in origin and related to Fermi surface nesting. However, the calculated Fermi surface of \( \text{K}_2\text{Cr}_3\text{As}_3 \) differs substantially from the \( \text{A}_2\text{Mo}_6\text{Se}_6 \) compounds, and many consider them distinct classes of materials. Nevertheless, the new observation is most consistent with a magnetic origin, linking the physics of both classes.