

Quantifying the impact of plasmon and paramagnon effects in "conventional" superconductors from the first principles

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The advances in the density functional theory for superconductors in the recent decade have paved a way to non-empirical calculation of superconducting transition temperature (T_c) of real materials. The theoretical extensions are also under way to include the effect of electronic dynamical charge and spin fluctuations with no adjustable theoretical parameter, which can be a first step toward a unified first-principles treatment of superconductors—from the conventional phonon to unconventional electron mechanisms.

With our recent first-principles results, we exemplify how and how much the dynamical charge fluctuation (plasmon) and spin fluctuation (paramagnon) effects modify the T_c in the typical phonon-mediated superconductors, which have previously been discussed in semiempirical manners.

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