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Properties for the superconducting state from a one-particle derivation of the BCS gap equation.[1] THOMAS JARLBORG, DPMC, University of Geneva, CH1211 Geneva 4, Switzerland — The BCS results for the superconducting gap Δ and T_C are obtained from a one-particle model and free electron bands. The gap becomes stable when the electronic energy gain of the band structure overcomes the energy needed for atomic vibrations or magnetic moment oscillations. The vibration/oscillation amplitudes determine the size of the superconducting gap, and the Fermi surface is important for the q-dependence. This permits for complementary interpretations of the parameters for superconductivity and modeling of density-of-state effects, where the mechanism for having a gap is less exotic. Thermal excitations of phonons and/or spin fluctuations can produce a pseudogap with many similarities with a superconducting gap. Results for the pseudogap in the normal state for copper oxides, obtained previously from band calculations for spin-phonon coupled modes [1], can be extended into the superconducting state. Possible extensions and limitations of the model for different situations are discussed.

[1]T. Jarlborg, Phys. Rev. B 79, 094530 (2009).

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