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The potential for mean-field d-wave superconductivity in graphite
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We investigate the possibility of inducing superconductivity in a graphite layer by electronic correlation effects. We use a phenomenological microscopic Hamiltonian[1] which includes nearest neighbor hopping and an interaction term which explicitly favors nearest neighbor spin-singlets through the well-known resonance valence bond (RVB) character of planar organic molecules. Treating the Hamiltonian in mean-field theory, allowing for bond-dependent variation of the RVB order parameter, we show that both s- and d-wave superconducting states are possible with the d-wave state having a significantly higher T_c at finite doping. By using density functional theory we show that the doping induced from sulfur absorption on a graphite layer is enough to cause an electronically driven d-wave superconductivity at graphite-sulfur interfaces (see e.g. [2]). We will also briefly discuss applying our results in the case of the intercalated graphites as well as the validity of a mean-field approach.
[1] G. Baskaran PRB **65** 212505 (2002)
[2] S. Moehlecke *et al.* PRB **69** 134519 (2004)

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