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Correlation-enhanced electron-phonon coupling produces high-temperature superconductors ZHIPING YIN, ANDREY KUTEPOV, GABRIEL KOTLIAR, Department of Physics and Astronomy, Rutgers University — The microscopic origin of superconductivity has been established in numerous classes of materials. In elemental metals it results from the exchange of phonons whereas in copper oxides and iron pnictides it is intimately connected to magnetism. On the other hand, the cause of superconductivity in a large third class of isotropic high temperature superconductors is still mysterious and subject of debate. In this talk, we will demonstrate that dynamical correlations among electrons enhance their coupling to phonons in a large number of superconductors, raising significantly the previously underestimated theoretical superconducting critical temperature T_c of up to a few Kelvin to their experimental values of tens of Kelvin. The mechanism we propose is quite general, explains the magnitude and the doping dependence of superconductivity in many materials such as the celebrated $Ba_{1-x}K_xBiO_3$ (T_C=32 K) compounds and the electron-doped β-HfNCl compounds (T_c = 25.5 K) and can be used to design other high temperature superconductors which have not yet been synthesized. We will also propose a few novel materials which are good superconductors in our theory and can be easily synthesized and tested by experiments.

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