

Superconductivity in diamond

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Commentary by Zachary Fisk, University of California, Davis.

Superconductivity has now been discovered in high pressure synthesized B-doped diamond at 4K. This brute force experiment continues the remarkable renaissance in new superconducting sp-materials. The theory preprints from Boeri et al.(1) and Lee and Pickett (2) come to interesting and similar conclusions: T_c arises from strong valence hole-optical phonon coupling, physics very similar to that believed responsible for the 40K superconductivity in MgB₂. This is a picture we are already acquainted with from doped C₆₀, in diamond's own family tree.

The new results provoke questions about where else in materials space the physics will play out, in particular where in transition metal compounds one might begin again. The old empiricism associated with the search for new superconducting materials in the A15 era appears now as one which led away from much that is interesting.

(1) Three-dimensional MgB₂-type superconductivity in hole-doped diamond (cond-mat/0404447) L. Boeri et al.

(2) Origin of Superconductivity in Boron-doped Diamond (cond-mat/0404547) K. W. Lee and W. E. Pickett