MAR05-2004-002045

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

Superconductivity in Bulk, Hole-Doped Diamond[1]

VLADIMIR SIDOROV, Institute for High Pressure Physics Russian Academy of Sciences, Troitsk and Los Alamos National Laboratory

Diamonds, synthesized at high pressure (9 GPa) and high temperature (2500-2800 K) in the systems boron carbide-graphite and boron-graphite, are heavily hole-doped by incorporation of boron into the diamond lattice. These diamonds were characterized by: X-ray diffraction, Raman scattering, NMR, SQUID magnetometry, calorimetry, Hall effect, resistivity and magnetic susceptibility measurements. They show an expanded ($\sim$1 % in volume) lattice with a softened zone-centre optical phonon mode and reduced Debye temperature, and exhibit bulk superconductivity below Tc $\sim$4 K. Upper critical field, specific heat and resistivity measurements provide a consistent set of materials parameters that favor a conventional, weak coupling electron-phonon interpretation of the superconducting mechanism at high hole doping. Preliminary measurements of conductance spectra, obtained with contacts fabricated at the surface of these hole-doped diamonds, indicate the appearance of superconducting gap below Tc.

[1]in cooperation with E.A. Ekimov, E.D. Bauer, N.N. Mel'nik, N.J. Curro, J.D. Thompson and S.M. Stishov