

CONDUCTIVITY OF CRYSTALS WITH SUPERCONDUCTING NANOSCALE INCLUSIONS

V. I. Sugakov, O. N. Shevtsova

A system of superconducting inclusions, which are immersed in a dielectric matrix has been studied. In the assumption that inclusion radius is less or order of coherence length a critical magnetic field of spherical isolated inclusion was determined. A temperature dependence of conductivity and conductivity as a function of magnetic field for a crystal with superconducting inclusions has been calculated. In the calculations the assumption was made that inclusion concentration is insufficient for onset of superconductivity in a whole sample (i.e. below threshold of percolation). It was shown that the presence of superconducting inclusions leads to the sharp increasing of conductivity of a sample at low temperatures, and to strong dependence of conductivity upon the magnetic field (magnetoresistance). Magnetoresistance is caused by superconductivity suppression in inclusions with increasing magnetic field. The influence of dispersion of inclusion sizes on the conductivity as a function of temperature and of magnetic field have been studied.