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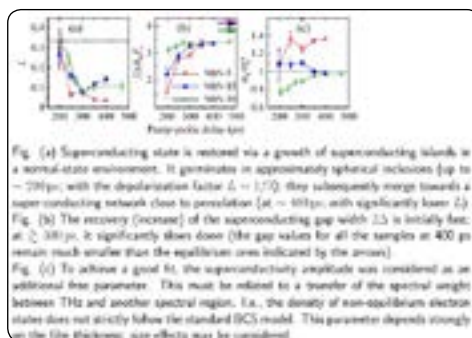


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Departure from BCS response in photoexcited superconducting films observed by terahertz spectroscopy

We investigate thin superconducting NbN films with various thicknesses by time-resolved terahertz spectroscopy. In agreement with previous reports, the equilibrium THz conductivity can be described by the BCS theory. Upon strong photoexcitation by femtosecond laser pulses, when the superconducting state is completely broken, the recovery dynamics occurs by a growth of initially spherical isolated superconducting islands in the normal-state environment. These islands subsequently merge towards a nearly percolated superconducting network. The recovery process is accompanied by a shift in the conductivity spectral weight, indicating a departure from the BCS character of the density of electron states in these islands. While the superconductivity recovers on the hundreds-picosecond time scale, the properties characterizing the superconducting state (such as the gap width and the density of states) recover much more slowly, at least on the nanosecond time scale.



Recent Publications

1. Matsunaga R and Shimano R (2012) Nonequilibrium BCS state dynamics induced by Intense terahertz pulses in a superconducting NbN film. *Physical Review Letters* 109, 187002.
2. Beck M, Rousseau I, Klammer M, Leiderer P, Mittendorff M, Winnerl S, Helm M, Goltsman GN and Demsar J (2013) Transient increase of the energy gap of superconducting NbN thin films excited by resonant narrow-band terahertz pulses. *Physical Review Letters* 110, 267003.
3. Kabanov V V, Demsar J and Mihailovic D (2005) Kinetics of a superconductor excited with a femtosecond optical pulse. *Physical Review Letters* 95, 147002.
4. Averitt R D and Taylor A J (2002) Ultrafast optical and far-infrared quasiparticle dynamics in correlated electron materials. *Journal of Physics-Condensed Matter* 14, R1357.

Biography

Christelle Kadlec obtained her PhD in Plasma Physics from the University of Orleans, France. She works as a Researcher in the Institute of Physics in Prague, Czech Republic in the field of THz spectroscopy, where she is considered as an expert in thin films. She is a co-author of more than 60 publications.

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