Energy Relaxation Time in NbN and YBCO Thin Films under Optical Irradiation

D. Rall[1,2], P. Probst[1], M. Hofherr[1], S. Wünsch[1], K. Ilin[1], U. Lemmer[2] and M. Siegel[1]

[1]Institut für Mikro- and Nanoelektronische Systeme,
University of Karlsruhe, Hertzstrasse 16, 76187 Karlsruhe, Germany
[2]Lichttechnisches Institut, University of Karlsruhe,
Engesserstrasse 13, 76131 Karlsruhe, Germany

E-mail: dagmar.rall@lti.uni-karlsruhe.de, p.probst@ims.uni-karlsruhe.de

Abstract - A systematic study of energy relaxation processes in thin NbN and YBCO films on sapphire substrates has been performed by means of the frequency domain technique. The magnetron sputtered NbN films of 3 nm to 22 nm thickness and pulsed-laser deposited YBCO with thicknesses between 20 nm and 45 nm were excited by amplitude-modulated optical radiation (λ=850 nm). The response spectra were analyzed on basis of the two-temperature model of the energy dynamics in the interacting electron and phonon subsystems at quasi-equilibrium conditions. An increase of the energy relaxation time with increasing film thickness has been obtained for both NbN and YBCO thin film samples. We argue that for both materials this characteristic time is mostly defined by phonon transfer through the film-substrate interface.

IEEE/CSC & ESAS EUROPEAN SUPERCONDUCTIVITY NEWS FORUM (ESNF), No. 11, January 2010
Published in *Journal of Physics Conf. Series* (*SuST*) 234, 042029 (2010)