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Pair-breaking of the superconducting thin films induced by the intense terahertz pulses HIRONARU MURAKAMI, CAIHONG ZHANG, IWAO KAWAYAMA, BIAOBING JIN, Osaka University, JIAN CHEN, Nanjing, PEIHEN WU, Nanjing University, MASAYOSHI TONOUCHI, Osaka University — High-power terahertz time-domain spectroscopy (THz-TDS) was used to examine YBCO and NbN thin films when transmitted by intense single-cycle THz pulses. This allowed for an investigation of the nonlinear, time-resolved behavior of superconducting thin films in the presence of strong THz electric fields with the field strengths of tens of kV cm^{-1}. In the case of low field strengths, the behavior of the thin films agrees with previous examinations by means of conventional, low-power THz-TDS. However, for strong THz electric fields, it was found by analysis with the two-fluid model that the superfluid population decreases dramatically, possibly due to Cooper pair breakup. This was accompanied by a drop in the imaginary part of the conductivity in the THz frequency range. Moreover, a high-intense THz-punp - THz-probe measurement was conducted with the both YBCO and NbN thin films and estimated the recombination time of quasiparticles excited by intense THz electric field in superconductos. As a results, It was found that the recombination time of YBCO was several picosecond and much shorter than that of NbN.

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