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Anomalous upper critical field of two-gap superconductor $Lu_2Fe_3Si_5$ YASUYUKI NAKAJIMA, HIKARU HIDAKA, TSUYOSHI TAMEGAI, University of Tokyo, TERUKAZU NISHIZAKI, TAKAHIKO SASAKI, NORIO KOBAYASHI, IMR, Tohoku University — Ternary-iron silicide superconductor $Lu_2Fe_3Si_5$ with $T_c = 6$ K has attracted attention because of the anomalous superconducting properties, such as a large residual linear term in the superconducting specific heat and a reduced normalized specific heat jump at T_c smaller than the BCS value. Our recent specific-heat study has revealed that these anomalies stem from the two distinct superconducting gaps. In order to clarify the details of the two-gap superconductivity in $Lu_2Fe_3Si_5$, we have prepared the high-quality single crystal and investigated the upper critical field H_{c2} obtained by resistivity measurements. We find that H_{c2} increases linearly with decreasing temperature down to $T_c/3$, and $H_{c2}(T = 0)$ exceeds the orbital depairing field described by the simple WHH theory. We also find that the angular dependence of H_{c2} is well described by anisotropic GL model unlike the case of typical two-gap superconductor MgB_2. We discuss the origin of these differences based on the nature of two gaps in the two superconductors.

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