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Superconductivity and anomalous magnetic phase in $LuGe_2$ single crystals NAKHEON SUNG, B.K. CHO, Gwangju Institute of Science and Technology (GIST), Y.J. JO, Kyungpook National University, S.K. CHOI, A.I. COLDEA, University of Oxford, H. KIM, R. PROZOROV, Ames Laboratory and Iowa State University — $LuGe_2$ single crystals ($ZrSi_2$-type orthorhombic structure, C_{mcm}) were synthesized by the high temperature metal flux method. $LuGe_2$ was found to be the type-II superconductivity below superconducting transition temperature, $T_c = 2.3$ K. An anomalous magnetic and electric phase below $T^* = 4$ K was found only along b-axis in electrical transport measurement, and confirmed additionally by magnetization and heat capacity measurement. From the heat capacity data, $LuGe_2$ was found to be the weak coupling BCS type superconductivity at T_c, whereas the anomalous phase above T_c seems to have a close correlation with the superconducting state below T_c. Upper critical field, $H_{c2}(T)$, of the superconductivity exhibits significant anisotropy either along b-axis or along a (and c)-axis. Recently, a possible second superconducting state in superconducting $YbSb_2$ single crystals, which has the same structure as $LuGe_2$, was reported. [1] Thus, we will discuss in detail on the anisotropic superconducting properties and the anomalous phase above T_c in terms of the possible second superconductivity as in $YbSb_2$.

[1] Liang L. Zhao, Stefan Lausberg, H. Kim, M. A. Tanatar, Manuel Brando, R. Prozorov, and E. Morosan, Phys. Rev. B 85, 214526 (2012)

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