凝縮系物理学ゼミナール

日時：6月 9日 （水）13：30～

場所：理学部5号館　413号室

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「Thermodynamical Investigation of the Gap Structure of the Quasi-One-Dimensional Superconductor $(TMTSF)_2ClO_4$」

The molecular salt $(TMTSF)_2X$ (X = ClO_4, PF_6, etc.) is the first discovered organic superconductor reported in 1980 [1,2], and its fascinating physical properties have kept attracting much attention throughout this 30 years [3,4]. This family is one of the most archetypal quasi-one-dimensional (Q1D) conductor and has been providing us with unique opportunities to study superconducting (SC) phenomena related to the low dimensionality. However, despite much effort devoted, fundamental information on its SC state, such as the gap structure and phase diagram, is still controversial or unknown [3,4].

In order to solve this 30-year-long issue, we newly developed a sensitve calorimeter. In this talk, we present results of our comprehensive field-angle-resolved heat-capacity studies. The temperature and field dependences of the heat capacity, as well as the field-directional dependence at low temperatures, strongly suggest that $(TMTSF)_2ClO_4$ is a singlet superconductor with line nodes on the SC gap. The thermodynamic phase diagrams of $(TMTSF)_2ClO_4$ are determined for all three principle field directions. Comparison of the thermodynamic phase diagrams with those from previous transport studies [5] are also discussed.

[1] D. Jerome et al., J. Phys. Lett. 41, L95 (1980).

[2] K. Bechgaard et al., Phys. Rev. Lett. 46, 852 (1981).

[3] K. Kuroki and Y. Tanaka, J. Phys. Soc. Jpn. 74, 1694 (2005).

[4] W. Zhang and C. A. R. Sa de Melo, Adv. Phys. 56, 545 (2007).

[5] S. Yonezawa et al., Phys. Rev. Lett. 100, 117002 (2008); J. Phys. Soc. Jpn. 77, 054712 (2008).