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Disappearance of Antiferromagnetic Order of CeCoSi Studied by Specific Heat under Pressure

Kenshin Kurauchi[1*], Takeshi Matsumura[1], Suguru Kishida[1], Taichi Tagawa[1], Nonoka Higa[1], Kazunori Umeo[1], Hiroshi Tanida[2]

[1]*Hiroshima University, Japan*

[2]*Toyama Prefectural University, Japan*

CeCoSi with a tetragonal CeFeSi-type structure (space group P 4/nmm, No. 129), exhibits a hidden ordered phase (Phase II) at T_0 ～ 12 K, whose order parameter has been unidentified. At T_N = 9.4 K, an antiferromagnetic (AFM) order takes place, which is described by the propagation vector q = (0, 0, 0), where the two Ce atoms in a unit cell located at non-centrosymmetric sites are antiferromagnetically coupled [1,2,3]. It is proposed that the phase II could be a quadrupole-ordered phase by incorporating the crystal-field excited state, since T_0 increases with increasing the magnetic field and pressure [2,3]. Recently, a structural phase transition to a triclinic phase has been observed [4]. Thereafter, the relationship between the structural phase transition and the hidden ordered phase in CeCoSi has been attracting strong interest.

In the present study, we performed specific heat measurements under pressure using an alternating current calorimeter capable of measuring up to 10 GPa [5], with the purpose of determining the pressure dependence of the phase transition at T_0. Although the anomaly at T_{s0} reflecting structural phase transition was too small to be detected, the anomaly at the AFM transition was clearly detected. We show that T_N increases from 9.4 K to approximately 11 K at 0.3 GPa and decreases at higher pressures, which are consistent with the results of electrical resistivity and magnetization [2,3]. The magnitude of the specific heat anomaly gradually becomes weak at high pressures and finally disappears around the critical pressure of ～ 1.4 GPa.

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*Corresponding author Kenshin Kurauchi
Affiliation Hiroshima University
E-mail address m222710@hiroshima-u.ac.jp