TECHNISCHE UNIVERSITÄT DRESDEN

Institut für Festkörper- und Materialphysik

IFMP Institut für Festkörper- & Materialphysik

IFMP Seminar

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Speaker **Moyu Kato**
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Title **Magnetism of Novel Kapellasite-type Quantum Kagome Antiferromagnet $InCu_3(OH)_6Cl_3$**

Abstract The quantum kagome antiferromagnet is a good playground for searching for quantum many-body states. Not only zero-field spin liquids, but also magnon crystallization with $^7/_9$, $^5/_9$, and ⅓ magnetization and field-induced spin liquids with ⅑ magnetization have been predicted [1]. However, the lack of ideal model materials and the difficulty of precise measurements under ultra-high magnetic fields of around 100 T have prevented experimental verification of these rich theoretical predictions.

We succeeded in synthesizing a novel model quantum kagome antiferromagnet, $InCu_3(OH)_6Cl_3$ (In-kapellasite). It crystallizes in the trigonal space group *P*31*m* with lattice constants *a*=12.3235 Å and *c*=6.0347 Å and a kapellasite-type kagome network [2]. Although the kagome network is slightly distorted because Cu forms two different isosceles triangles, there is a three-fold axis on the In site, which marks a significant difference from other distorted kagome materials [2].

The antiferromagnetic Curie-Weiss temperature and effective magnetic moment of In-kapellasite are estimated to be Θ_W=–12.8 K and p_{eff}=2.05, respectively. Short-range order occurs at 7 K where the magnetic susceptibility exhibits a slight upturn and the heat capacity shows a broad peak. Subsequently, long-range magnetic order develops at 1.8 K, evidenced by a sharp peak in the heat capacity. In high-field magnetization measurements up to 50 T, the full magnetization process to saturation was observed. Interestingly, a ⅓-magnetization plateau is observed at relatively low fields of ~7–14 T.

[1] S. Nishimoto *et al*., Nat. Commun. **4**, 2287 (2013).

[2] H.K. Yoshida *et al*., JPSJ **86**, 033704 (2017).

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