Seminar announcement

Thursday, February 2nd , 2023
2 pm
ZNN, Seminar room EG 0.001
Exclusively in person

"Evaluation of van der Waals ferromagnet Fe_5GeTe_2 and its application to spintronic devices"

FeGeTe is one of the most popular van der Waals (vdW) ferromagnets because it has a relatively high Curie temperature (Tc > 200 K), compared to other vdW ferromagnets (for example, CrI3: Tc ~ 61 K , CrGeTe3: Tc ~ 66 K). In addition, it is a good metal, which makes it possible to perform electrical transport measurements. Among several FeGeTe compounds, Fe5GeTe2 [1] has attracted much attention because of not only its Tc (higher than room temperature) but also tunable magnetic phases and magnetic anisotropies by making the film thinner or by substituting other elements for Fe. Therefore, Fe5GeTe2 could be a strong candidate for future vdW spintronic devices. Recently, we fabricated Fe5GeTe2 thin film devices (down to 4 unit-cell layers) and performed electrical transport measurements [2,3]. A clear anomalous Hall effect (AHE) was observed below room temperature. With decreasing temperature, the magnitude of the AHE becomes larger but starts to decrease at around 100 K. Below this temperature, on the other hand, the coercive filed is enhanced. These results are also highly dependent on the crystal synthesis method (rapid or slow cooling after their synthesis).The enhancement of the coercive field as well as the reduction of the AHE can be explained by the magnetic ordering of a specific Fe site, so-called Fe1 site: other Fe sites (Fe2 and Fe3 sites) are already ferromagnetically ordered at 310 K, while the Fe1 site would be ferrimagnetically ordered below 100 K with respect to the Fe2 and Fe3 sites. In this seminar, I will also discuss recent results on the effect of substituting Co for Fe [4] and the spin Hall effect in the Fe5GeTe2 films [5], which could pave the way for novel vdW spintronic devices.

[1] J. Stahl et al., Allg. Chem. 644, 1923-1929 (2019). [2] T. Ohta et al., APE 13, 043005 (2020)
[3] T. Ohta et al., AIP Advances 11, 025014 (2021). [4] T. Ohta et al., submitted. [5] T. Ohta et al., in preparation

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