Graduate Program in Spintronics Seminar 2023

Abnormal Seebeck effect in stacked 2D $PtSe_2/PtSe_2$ homostructures

4:00 pm Monday, **August 21**

Room 745, Science Complex B,
School of Science, Aobayama Campus

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(Office closed from August 10 – 16)

Title: Abnormal Seebeck effect in stacked 2D $PtSe_2$/$PtSe_2$ homostructures

By Sang-Kwon Lee (Physics Department, Chung-Ang University, Seoul, Korea)

Abstract: When a thermoelectric (TE) material is deposited with a secondary TE material, the total Seebeck coefficient in this stacked layer is generally represented by a parallel model. Accordingly, when TE materials having the same thickness are vertically stacked vertically, the total Seebeck coefficient along the sample in the transverse direction is not expected to remain unchanged as in a single layer. Here we report a new Seebeck effect in a stacked 2D/2D semi-metallic $PtSe_2$ films, where the extra in-plane Seebeck voltage produces at the interface between the 2D $PtSe_2$ layers under transverse temperature gradient. We refer to the anomalous Seebeck effect as the interfacial Seebeck effect in the 2D/2D stacked $PtSe_2$ films. Surprisingly, we confirm that the Seebeck coefficient linearly increases with increasing the stacked 2D layers, and finally we observe a very large Seebeck coefficient exceeding approximately 210 μV/K at 300 K obtained in three-layer-stacked $PtSe_2$ films. This unusual behavior is brought about by the interfacial Seebeck effect at the interface between the 2D PtSe2 layer due to the longitudinal temperature gradient in the samples. This finding represents important achievement in understating new physics in Seebeck effect and provide promising platform with a high figure-of-merit in 2D layered materials. At the end of my talk, I will briefly introduce the research topics, including Valley-driven Nernst effect in Pt/YIG bilayer with 2D TMDC monolayer etc., that we are currently conducting in our research laboratory in Chung-Ang University.