



# Graduate Program in Spintronics Seminar 2023

## Abnormal Seebeck effect in stacked 2D PtSe<sub>2</sub>/PtSe<sub>2</sub> homostructures

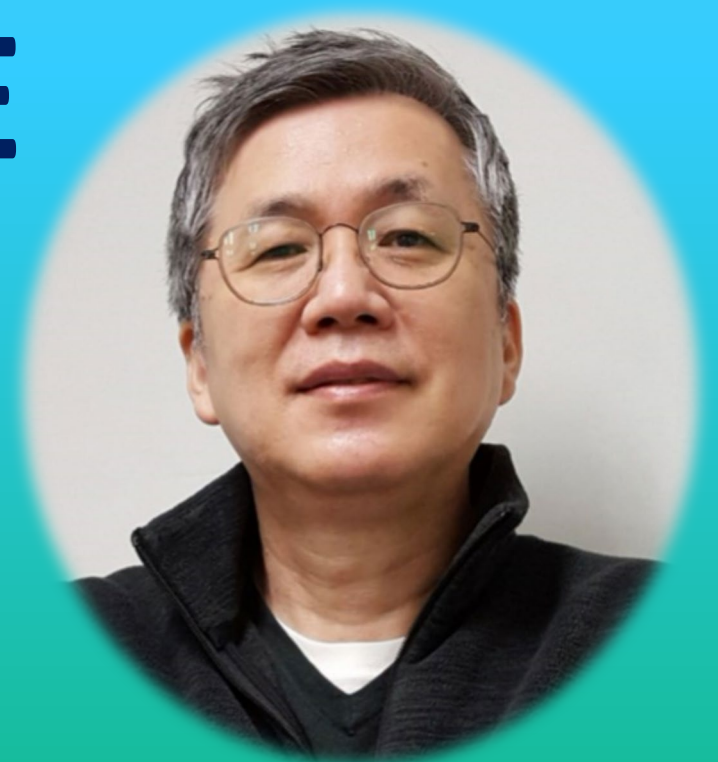


**4:00** pm Monday, **August 21**

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

Professor **Sang-Kwon LEE**

Department of Physics,  
Chung-Ang University,  
Seoul, Republic of Korea



Contact: **GP-Spin Office**

Email: [spin.all\[at\]grp.tohoku.ac.jp](mailto:spin.all@grp.tohoku.ac.jp), Phone: 022-795-3657  
(Office closed from August 10 – 16)

**Title: Abnormal Seebeck effect in stacked 2D PtSe<sub>2</sub>/PtSe<sub>2</sub> 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<sub>2</sub> films, where the extra in-plane Seebeck voltage produces at the interface between the 2D PtSe<sub>2</sub> layers under transverse temperature gradient. We refer to the anomalous Seebeck effect as the interfacial Seebeck effect in the 2D/2D stacked PtSe<sub>2</sub> 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  $\mu\text{V}/\text{K}$  at 300 K obtained in three-layer-stacked PtSe<sub>2</sub> films. This unusual behavior is brought about by the interfacial Seebeck effect at the interface between the 2D PtSe<sub>2</sub> 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.