612th ASRC Seminar

Date : 16:00- Tuesday, January 26

Location : Meeting room 103, ASRC Building

Speaker : Dr. Je-Geun Park
(Seoul National University)

Title : Metal-insulator transitions in Fe_3O_4 nanocrystals and beyond

Abstract: The metal-insulator transition observed in magnetite (Fe_3O_4) by Verwey was the discovery of immense implications and heralded the several decades-long active researches that has followed. This Verwey transition is notoriously difficult to tackle and has been eluded many, both theoretical and experimental attempts to unravel the true origin of the interesting phenomenon. Some coherent, yet still exotic to say least, picture has only emerged recently after extensive studies using state-of-the-art techniques and analytical tools at our disposal. Ever since similar interesting metal-insulator transitions have been found in several other materials and become an important problem in its own right.

In this talk, I will cover how the metal-insulator transitions evolves as the particle size gets reduced for Fe_3O_4 nanocrystals. By combining both physical and chemical methods, we could investigate the size-dependence of the Verwey transition on the nm scale. To our surprise, we discovered by taking advantage of several experimental techniques and using nanocrystals of high-quality that the Verwey transition survives down to 10 nm before disappearing suddenly. We will discuss how this particular work may hold some interesting promises for other oxide materials, in particular strongly correlated electron physics.

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