



IBS Center for Molecular Spectroscopy and Dynamics

COLLOQUIUM

- **SPEAKER**

Dr. Byung-Kuk Yoo (California Institute of Technology)

- **TITLE**

Ultrafast electron microscopy: applications in chemical and materials sciences

- **ABSTRACT**

Unlike the conventional transmission electron microscope (TEM), 4D ultrafast electron microscopy (4D UEM) has a time resolution that is 10 orders of magnitude better than that of TEM. Instead of using thermionic electrons in TEM, laser-driven single pulses of electrons allow various modes of detection such as imaging, diffraction, and spectroscopy, all with unprecedented spatiotemporal resolution; sub-nanometer and femtosecond. In this presentation, I will discuss the development of 4D UEM and summarize the up-to-date accomplishments that represent its broad capability in materials and related fields. First, I will demonstrate the critical role of 4D UEM in investigating the crystallization dynamics of matter. It could observe in space and time the ephemeral nucleation of liquid-to-crystal phase transitions of titanium dioxide by probing the transient electron diffraction intensities. Interestingly, it is found that the temporal behavior of crystallization exhibits unique two-step dynamics, with a robust plateau that extends over a microsecond. Such behavior reflects the presence of intermediate structure(s) that are the precursor of the ordered crystal state. Secondly, I will introduce how this technique provides a dynamic probe for catalytic active site in photocatalytic materials and visualizes the femtosecond atomic movement at the titanium active center in a single-site photocatalyst. These findings contribute fundamental insights for developing advanced photocatalysts and suggest broad ranges of applications.

- **DATE AND VENUE**

October 25, 2017 (Wednesday, 5:00 - 6:00 pm)
Seminar Room 116, KU R&D Center

- **LANGUAGE**

Korean

- **INVITED BY**

Prof. Kyungwon Kwak

* If you want to have a dinner with Dr. Byung-Kuk Yoo, please contact to Prof. Kyungwon Kwak (kkwak@korea.ac.kr).

