

CBC SEMINAR ANNOUNCEMENT

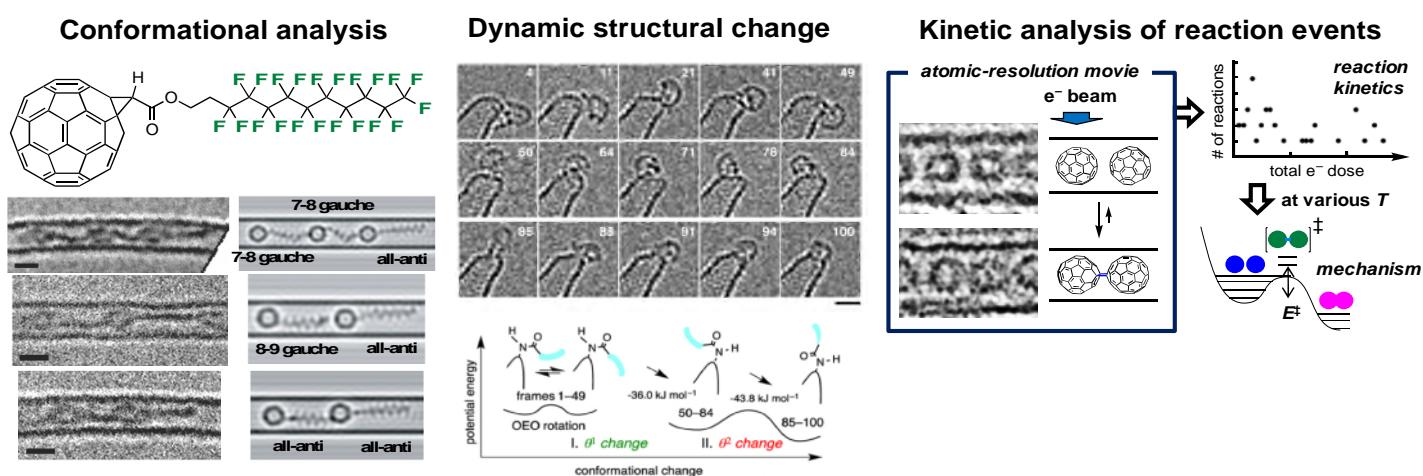


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Atomic-Resolution Electron Microscopy for Seeing Molecular Motion, Assembly and Reactions

Whereas a spatial- and time-average of molecular ensembles has been the conventional source of information on molecular structures, atomic resolution movies of single organic molecules and molecular clusters obtained by single-molecule atomic-resolution real-time electron microscopy (SMART-EM) developed by us have recently emerged as a new tool to study the time evolution of the structures of individual molecules.¹ The key of our technique is that we observed little sign of decomposition of the specimen molecules encapsulated in or attached to a single-walled carbon nanotube (CNT) as opposed to solid organic materials. The high specimen stability and the real-time movie recording enable us to study on the conformation of each C–C bond in single perfluoroalkyl fullerene molecules,² dynamic conformational changes of linear molecules,^{3,4} and structure of organic nanoclusters formed as a precursor of a crystal nucleus from supersaturated solution.⁵ We are also able to study chemical reactions from a movie of individual reaction events occurring at various temperature by using CNT as a sensitizer and a thermal bath. Statistical analysis of electron-beam driven conversion of a van der Waals C₆₀ dimer to a [2+2] dimer over many molecules and temperatures provides an experimental proof of correlation between conventional transition state theory and statistics of individual molecular events.⁶

¹ Nakamura, E. *Acc. Chem. Res.* **2017**, *50*, 1281–1292. ² Nakamura, E. et al. *J. Am. Chem. Soc.* **2008**, *130*, 7808–7809. ³ Harano, K. et al. *J. Am. Chem. Soc.* **2014**, *136*, 466–473. ⁴ Gorgoll, R. M. et al. *J. Am. Chem. Soc.* **2015**, *137*, 3474–3477. ⁵ Harano, K. et al. *Nat. Mater.* **2012**, *11*, 877–881. ⁶ Okada, S. et al. *J. Am. Chem. Soc.* **2017**, *139*, 18281–18287.



Date: 11th February 2019 (Monday)
Time: 11.00am to 12.30pm
Venue: SPMS Research & Graduate Studies
Office: Conference Room
Host: Assistant Professor ITO Shingo