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Probing Active Species in the Nanoscale by Combining XAFS and TEM in Operando Conditions[1] ANATOLY FRENKEL, Stony Brook University — Understanding mechanisms of work in nanoscale systems is often hindered by their inherent complexity and by our inability to identify and characterize their "active" sites. In the size range of 1-5nm, they feature a variety of structural motifs, sizes, shapes, compositions, degrees of crystalline order as well as multiple temporal scales. An additional challenge is that only a fraction of them are actors in the catalytic performance, while majority are spectators. Significant progress in developing such tools for studying nanomaterials can be achieved only when active species can be reliably isolated from spectators, and their role in mechanism of work is understood. In our approach the activity of nanomaterial is measured concurrently with other characteristics, obtained by advanced scattering, spectroscopy and imaging methods. In this talk I will demonstrate the application of a microreactor, compatible with electron microscopy and X-ray Absorption Fine Structure spectroscopy probes, for this purpose. I will illustrate its application by our observation of reaction-driven restructuring of Pt catalysts in the size range from single atoms to 3nm in diameter during catalytic hydrogenation of ethylene.

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