Room 404AB: Sunday, February 16

1:30 PM – 3:00 PM
Bruker

Visualizing Molecular Dynamics with High-Speed Tip-Scanning Atomic Force Microscopy
Biological systems exhibit very high structural and functional dynamics on molecular scales. Understanding the principles of the kinetics behind structural changes at that scale is of critical importance when studying samples ranging from single membrane proteins to complex macromolecular systems, in order to accurately develop novel therapeutic applications. We have used high-speed tip-scanning atomic force microscopy (AFM) with a kilohertz linerate to visualize molecular dynamics by enabling temporal resolution on the sub-100-milisecond scale. The use of a tip-scanning AFM, as compared to a sample-scanning system, enables high-resolution correlation experiments with advanced optical techniques. We will give two examples in which high-speed tip-scanning AFM was applied for studying of structural transitions and biomolecular dynamics in samples, containing triangular DNA origamis and photosensitive surfactants.

DNA origami structures serve as a functional template in multiple artificial and native molecular systems. We studied the development of order in 2D DNA triangular Rothemund lattices. By mobilizing the DNA origami adsorption on mica with varying buffer composition we looked at the temporal dependence between lattice order development and Na+ ion content in the studied sample with a temporal resolution of 1 frame/s.

We monitored the structural photosensitive transition of photosensitive surfactants under external light-induced deformation. By simultaneous high-speed AFM measurements and switching the external wavelength illumination from 365 nm to 546 nm and vice versa, we could monitor and induce a reversible structural transition within the studied sample in real-time.

Speaker
Ming Ye, Application Scientist, Bruker Nano Surfaces and Metrology Division