Integration of Atomic Force Microscopy with Optical Microscopy and Spectroscopy

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We will demonstrate capabilities of Atomic Force Microscopy integrated with various optical microscopy and spectroscopy techniques: Confocal Raman/Fluorescence/Rayleigh microscopy, Scanning Near-field Optical Microscopy (SNOM, a-SNOM, s-SNOM), Tip Enhanced Raman Microscopy and others. AFM and optical techniques provide complimentary information about sample structure, its physical and chemical properties. Results will be demonstrated for various types of samples: polymer blends, pharmaceutical tablets, graphene, nanowires and nanotubes, solar cells, silicon devices, hard disk drives etc.

Tip Enhanced Raman Scattering (TERS) is the technique utilizing a special AFM probe (nano-antenna) to localize light at the nanometer scale area near the probe apex. When scanning the sample with respect to the probe, the obtained optical (Raman or fluorescence) maps have lateral resolution which is not limited by the light diffraction. TERS and other tip assisted optical techniques (tip enhanced fluorescence, scattering SNOM etc.) will be discussed. The successful TERS results achieved due to deep integration of AFM with confocal Raman microscopy will be demonstrated – with lateral resolution down to 15 nm.

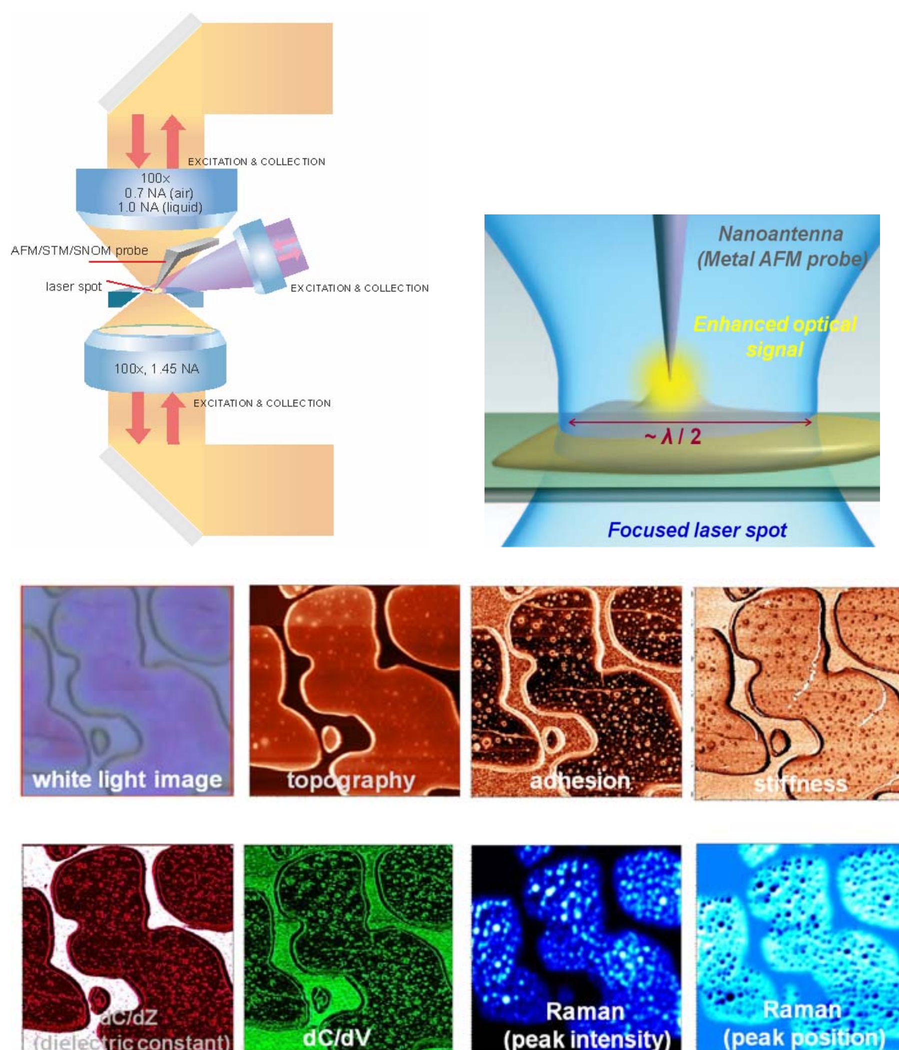

Figure. (Upper left) universal integration of AFM with light: “4Pi” optical access to AFM tip.
(Upper right) principle of tip assisted optical techniques (Tip Enhanced Raman Scattering and others).
(Bottom) Comprehensive AFM-Raman characterization of polymer blend