

Vibrational fingerprints of (sub)monolayer adsorbates - An introduction to tip-enhanced Raman spectroscopy

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Tip-enhanced Raman spectroscopy (TERS) meets one long-expected goal in surface science: the simultaneous topographic and chemical investigation of nanometer-sized sample regions, which is rendered possible by the combination of scanning probe microscopy (SPM) and Raman spectroscopy.

Central to the TERS technique is a metal probe (e.g. STM tip) at close vicinity to the sample surface which functions as a nearfield enhancer. The illumination of the tip by the excitation laser creates a giant electromagnetic field between the tip apex and the substrate. Consequently, only the molecules adsorbed underneath the tip apex, over a radius of approximately a few nanometers depending on the tip curvature, experience this enhanced field and give rise to intense characteristic Raman bands. (Sub)monolayer adsorbates can be investigated down to the single-molecule level.

I will discuss the possibilities and limitations of TERS by presenting recent literature highlights and describe our progress with the implementation of electrochemical TERS setup for the study of electrified solid/liquid interfaces.