SEMINAIRE ISMO

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AFMIR :
A powerful tool for Infrared Nanospectroscopy

The principle is based on detecting the local thermal expansion of the sample, irradiated at the wavelength of its absorption bands. This expansion is detected by the AFM tip in contact mode. As the duration of expansion and relaxation of the sample is always shorter than the response time of the cantilever in contact, the excitation transmitted to the cantilever acts as an impulse function, exciting oscillations at resonant frequencies of the cantilever. The technique can create nanoscale IR absorption spectra by recording the amplitude of these oscillations as a function of wavelength and chemical maps by measuring the oscillation amplitude as a function of position. Because the AFM probe tip can map the thermal expansion on very fine length scales, the AFM-IR technique provides a robust way to obtain interpretable IR absorption spectra at spatial resolution scales well below the diffraction limit. The technique also provides simultaneous and complementary mapping of mechanical properties and has been widely and successfully applied to applications in polymers and the life sciences. A recently identified candidate to generate bio-oils is the bacterium S*treptomyce*s, a soil organism which can store excess of carbon into TriAcylGlycerols (TAGs), a ready-to-use source for bio-diesel production.

Most previous AFM-IR measurements have been performed using total internal reflection illumination from below the sample, generally requiring samples to be prepared as thin sections transferred to an IR transparent prism. We have recently extended the AFM-IR technique to work in a "top side illumination" configuration and with a new tunable laser source (Quantum cascade laser). The top side illumination enables a much broader range of samples to be measured and the QCL source provides to the nanometer resolution and sensitivity.

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