Infrared nanoscopy and nano-FTIR spectroscopy by elastic light scattering from a scanning probe tip

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With the development of scattering-type scanning near-field optical microscopy (s-SNOM) [1] and nanoscale FTIR spectroscopy [2,3], the analytical power of IR and THz imaging has been brought to the nanometer scale. The spatial resolution of about 10 - 20 nm opens a new era for modern nano-analytical applications such as chemical identification, free-carrier profiling and near-field mapping of plasmons.
s-SNOM and nano-FTIR spectroscopy are based on elastic light scattering from AFM tips. Acting as an optical antenna, the tip convert the illuminating light into strongly concentrated near fields at the tip apex, providing a means for localized excitation of molecule vibrations, plasmons or phonons in the sample surface. Recording the tip-scattered light yields nanoscale-resolved IR images and spectra, beating the diffraction limit by orders of magnitude.

After a brief overview of fundamentals and applications, recent achievements such as IR-spectroscopic nanoimaging of polymers and proteins [4] will be presented, as well as the launching and mapping of ultra-confined plasmons in graphene [5,6].

References

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