

## **Surface vibrational modes studied with He-scattering, HREELS and STM**

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The use of highly monochromatic beams of He-atoms and low energy electrons (HREELS) allows the study of phonon dispersion relations of surface vibrational modes. The apparatus requirements for both methods are outlined and recent examples of investigations on various surface systems are presented. Systems investigated include: Surface phonons in quasicrystals, surface modes in ultrathin films (He-scattering) and graphite stripes on stepped metal surfaces (HREELS). These results are used to discuss the advantages and shortcomings of both methods. HREELS is also an important tool for the investigations of internal vibrations of molecules adsorbed on surfaces.

It is further demonstrated that with the scanning tunneling microscope (STM) the vibrational excitations of individual molecules can be measured and "vibrational imaging" allows precise determination of the local arrangement of molecules. The electron current can also be adjusted to induce such strong vibrations that chemical reactions like stripping off hydrogen from molecules can be induced locally.