s-SNOM for various applications: *Carrier density profiling in semiconductors, plasmonic field mapping, 2D-material characterization, and chemical identification of biomaterials and polymers*

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Scattering-type Scanning Near-field Optical Microscopy (s-SNOM) is a scanning probe approach to optical microscopy and spectroscopy bypassing the ubiquitous diffraction limit of light to achieve a spatial resolution of about 10 nanometers. s-SNOM employs the strong confinement of light at the apex of a sharp metallic AFM tip to create a nanoscale optical hot-spot. This defines the high resolution that can be achieved independent from the used wavelength from the UV, visible, IR, even up to the THz spectral region. Interferometric detection of the scattered light from the hotspot gives access to local optical properties like absorption and reflection, allowing FTIR spectroscopy on the 10 nm length scale for nano- chemical identification and compositional mapping of various organic and inorganic materials. The optical near-field hotspot can also be employed to excite and detect polaritons which enables their observation in 2D materials in real space, but also allows the quantification of local free carrier properties in doped semiconductors.