

# LT STM

## Tip Enhanced Raman Spectroscopy (TERS)

Optical spectroscopy techniques like near-infrared, TERS or low-temperature fluorescence provide detailed information about the chemical and environmental structure on organic systems. Here, we introduce our new concept for advanced optical experiments at helium temperature in ultra-high vacuum environment.

To guarantee best optical conditions, the optical integration is optimised on the following key factors:

- Highest detection efficiency is provided by the numerical aperture (NA) of  $NA = 0.39$  which results in a theoretical focus diameter of 835nm at 532nm excitation wavelength.
- The angle of incidence in this setup is optimised to  $30^\circ$ .
- Three piezo-motors allow the adjustment of the lens in the full temperature range from 4.5K to 300K.
- The x/y piezo motor is moving within the sample coordinate system, while the z-piezo motor is oriented along the optical axis of the lens. This ensures convenient operation of the optical setup.

In combination with the proven performance of the LT STM, this modification allows a broad range of new and exciting experiments.

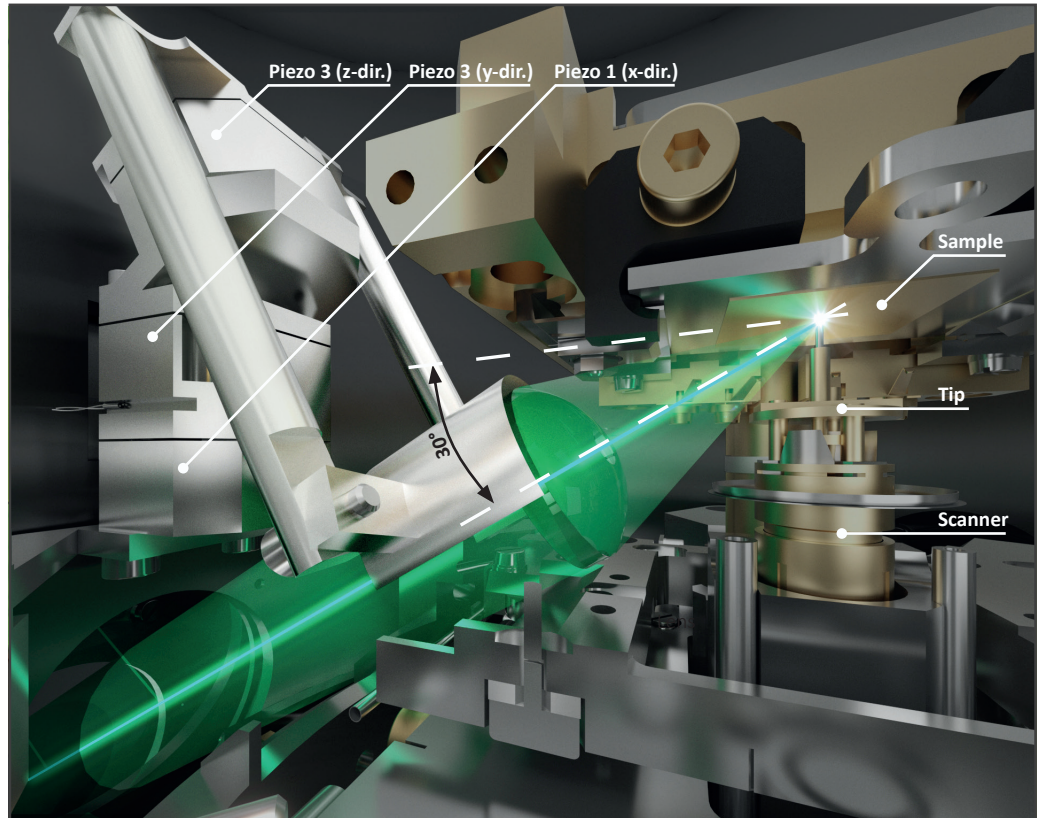


Figure 1: The preparation for low temperature Tip Enhanced Raman Spectroscopy option (TERS) consists of a three dimensions movable lens (3x3x3mm). The high numerical aperture of  $NA=0.39$  and the  $30^\circ$  angle of incidence provides a high detection efficiency.



Figure 2: MULTIPROBE LT XA with ARPES analyser. Insert shows the SPM head of the LT STM.

### LT STM for TERS:

- Numerical aperture of 0.39
- Optimised in-situ lens adjustment
- $30^\circ$  angle of incidence
- 3D movable lens system
- Lens adjustment from 4.5K to 300K