

***From amino acids to proteins – spectral analysis on the nanometer scale using
Tip-enhanced Raman Scattering***

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Optical techniques that allow a lateral resolution beyond the diffraction limit become more and more common. In particular the combination of near-field techniques with Raman spectroscopy is desirable because label free information can be obtained and even conformational changes, otherwise a great challenge can be identified. The distinct signal enhancing properties of surface enhanced Raman scattering (SERS) allow the specific combination of Raman spectroscopy and near-field optical techniques. Metalized scanning tips that are smaller than the diffraction limit act as field enhancing nanometer sized probes (tip enhanced Raman scattering TERS).

While a major challenge is the optimization of the probes with respect to high enhancement factors our main goal is the application of this method to problems in life science.

TER spectra of nucleobase nanocrystals and also of single RNA and DNA strands have been already obtained and provide the potential for a label free direct sequencing. We are also working on TERS of amino acids and small peptides immobilised on solid surfaces. A major challenge here is the sample preparation. The use of transparent and ultraflat metal substrates allows the use of standard immobilisation techniques and in addition even increase the sensitivity due to the creation of so called gap modes. We will present results on various amino acids and also on small peptides immobilised on different metal substrates. Again the goal of this research is the label free single molecule characterisation of chain like bio molecules.