

AFM/Raman-TERS Workshop
September 27, 2016
Northwestern University

High-speed Tip-Enhanced Raman Imaging

M. Chaigneau

HORIBA Scientific, Avenue de la Vauve- Passage Jobin Yvon, 91120 Palaiseau, France
marc.chaigneau@horiba.com

Tip Enhanced Raman Scattering (TERS), a technique that provides molecular information on the nanometer scale, has been a subject of great scientific interest for 15 years. But regardless of the recent achievements and applications of TERS, ranging from material science and nanotechnology, strain measurement in semiconductors, to cell biological applications, the TERS technique has been hampered by extremely long acquisition times, measured in hours, required for collection of reasonably high pixel density TERS maps.

In this talk, specifics of the TERS setup that enable fast, high pixel density nanoRaman imaging will be discussed: The innovative integration of technologies brings high-throughput optics and high-resolution scanning for high-speed imaging without interferences between the techniques. The latest developments in TERS probes also provide reliable solutions for academic and industrial researchers alike to easily get started with nanoscale Raman spectroscopy.

Thanks to those latest instrumental developments, we will present the nanoscale imaging of nanopatterned flakes of graphene and graphene oxide, carbon nanotubes, MoS₂ and WS₂ flakes with a spatial resolution routinely obtained in TERS maps in the 15 - 20 nm range and a best resolution achieved being of 8 nm.

To continue on the way to high-speed TERS imaging, we present also here a stimulated TERS technique that offers the possibility for a substantially faster imaging of the surface. This is made by introducing a stimulating beam confocal with the pump beam into a conventional TERS setup. A billion-fold increase in the Raman signal over conventional tip-enhanced Raman spectroscopy/microscopy is shown.