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A Unique Probe for Tip Enhanced Raman Scattering and Shadow NSOM AARON LEWIS, Hebrew University of Jerusalem, HESHAM TAHA, RIMMA DEKHTER, GALIA ZINOVIEV, GALINA FISH, Nanonics Imaging Ltd. — We present a unique atomic force microscope [AFM] probe for tip enhanced Raman scattering [TERS] and a new form of near-field microscopy, "Shadow Near-field Scanning Optical Microscopy". The probe consists of a single gold nanoparticle grown at the tip of a cantilevered nanopipette, exposed to the optical axis of an upright or inverted optical microscope. When these probes are used in combination with a Nanonics MV 2000 AFM/NSOM system, we show that a protocol for independent motion of the probe and the sample can produce enhancement or a shadow effect. Both of these effects are enhanced by the ability to affect different Raman spectra with the tip in & out of contact while independently scanning the sample. We analyzed Raman signals of a thin nanometric strained Si layer deposited on bulk Si and developed an understanding of optical mechanisms of enhancement, scattering and shadowing. Our results show different optical mechanisms occur as a result of tip & sample interactions, including TERS effect obtained by near-field interaction of the probe with the top layer of strained Si. Large enhancements of at least 4 orders of magnitude are seen and analyses of relative intensities of bulk and strained Si Raman peaks show an increase in light scattered by bulk or effective shadowing of the surface.

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