

Abstract Submitted  
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**Robust Tips for High Resolution Chemical Imaging**<sup>1</sup> CARLOS BARRIOS, ANDREY MALKOVSKIY, ALEXANDER KISLIUK, ALEXEI SOKOLOV, MARK FOSTER, Department of Polymer Science, The University of Akron — Tip enhanced Raman spectroscopy (TERS) combines scanning probe microscopy with Raman spectroscopy, taking advantage of apertureless near-field optics. A plasmonic structure at the apex of a sharp tip provides signal amplification required for chemical imaging. Plasmonic structure characteristics such as roughness, shape, and radius determine the spatial resolution and signal enhancement. Unfortunately, noble metal nanostructures have limited lifetimes due to mechanical, chemical, and thermal degradation. Lifetime extension requires slowing degradation processes while minimizing unfavorable influences on the optical response. An ultrathin SiO<sub>x</sub> protective coating provides lifetime improvement of silver plasmonic nanostructures on SPM tips. Controlled physical vapor deposition (PVD) of Al can be used to create ultrathin (~2-3 nm) Al<sub>2</sub>O<sub>3</sub> coatings that improve significantly the stability and wear resistance of plasmonics structures without substantial degradation of optical properties. Such a coating completely prevented decay in plasmonic activity after 40 days of use.

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