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Protected Plasmonic Nanostructures for High Resolution Chemical Imaging using Tip Enhanced Raman Spectroscopy REBECCA BUTT, CARLOS BARRIOS, ANDREY MALKOVSKIY, ALEXANDER KISLIUK, University of Akron, Dept of Polymer Science, ALEXEI SOKOLOV, University of Akron, MARK FOSTER, University of Akron, Dept of Polymer Science — Tip enhanced Raman spectroscopy (TERS), an emerging technique that combines optical microscopy and scanning probe microscopy, provides the sensitivity and selectivity necessary for high-resolution chemical imaging of polymer surfaces. An unprecedented 20 nm lateral resolution for the chemical imaging has been achieved. Unfortunately, the fragile plasmonic structures used to enhance the electric field are prone to mechanical, chemical, and thermal degradation. Developing robust noble metal nanostructures with stable plasmonic resonance is essential to reliable high resolution chemical imaging. Covering the metal layer with organic and inorganic ultrathin coatings is being investigated to extend the plasmonic activity of the engineered nanostructures. Addition of an ultrathin aluminum oxide (Al_2O_3) coating to a silver-coated scanning probe microscopy tip for TERS significantly improves plasmonic structure stability without sacrificing the initial TERS efficiency. This ultrathin coating provides wear resistance and stops chemical degradation responsible for the loss of signal enhancement.

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