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High-resolution element-selective microscopy using X-ray enhanced Scanning Tunneling Microscopy[1] VOLKER ROSE, JOHN FREELAND, KENNETH GRAY, STEPHEN STREIFFER, MATTHIAS BODE, Argonne National Laboratory — Nanoscale structures are at the forefront of fundamental research as well as the keystone for whole new classes of potential applications. Proper understanding of these systems requires tools with both the ability to resolve the nanometer scale as well as provide detailed information about chemical, electronic and magnetic structure. Scanning probe microscopies achieve the requisite high spatial resolution; however, direct elemental determination is not easily accomplished. X-ray microscopies, on the other hand, provide elemental selectivity, but currently have spatial resolution only of tens of nanometers. We present a radically different concept that employs detection of local x-ray interactions utilizing a scanning probe that provides spatial resolution, and x-ray absorption directly yields chemical, electronic, and magnetic sensitivity. The achievement of nanometer spatial resolution with direct elemental selectivity will have a tremendous impact on our ability to probe and understand complex phenomena occurring in nanostructures.

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