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Atom-Specific Interaction Quantification and Identification by 3D-SPM TODD C. SCHWENDEMANN, Southern Connecticut State University, MEHMET Z. BAYKARA, HARRY MONIG, Dept. of Mech. Eng & Mat. Sci., Yale University, MILICA TODOROVIC, Dept. de Física Teórica de la Materia Condensada, JAN GOTZEN, OZHAN UNVERDI, Dept. of Mech. Eng & Mat. Sci., Yale University, RUBEN PEREZ, Dept. de Física Teórica de la Materia Condensada, ERIC I. ALTMAN, Dept. of Chem. & Env. Eng., Yale University, UDO D. SCHWARZ, Dept. of Mech. Eng & Mat. Sci., Yale University — Entire scientific disciplines such as mechanics and chemistry are governed by the interactions between atoms and molecules. On surfaces, forces extending into the vacuum direct the behavior of phenomena such as thin film growth, nanotribology, and surface catalysis. To advance our knowledge of the fundamentals governing these topics, it is desirable to simultaneously map electron densities and quantify force interactions between the surface of interest and a probe with atomic resolution. Using the oxygen-reconstructed copper (100) surface as a model system, we demonstrate that much of this information can be derived from combining three-dimensional atomic force microscopy (3D-AFM) with simultaneous STM. The three-dimensional scanning probe microscopy (3D-SPM) variant resulting from this combination provides complementary information in the various interaction channels recorded. The surface oxide layer of copper (100) features defects and a distinct structure of the Cu and O sublattices that is ideally suited for such model investigations. The analysis of our experimental results allows for the identification of atomic species and defects on the sample surface through the comparison of simultaneously recorded force and current data.

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