

Abstract Submitted
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Single-Molecule Investigations of Organic, Inorganic, and Organometallic Chemical Mechanisms¹ SUZANNE BLUM, University of California, Irvine — Single-molecule fluorescence microscopy has the potential to revolutionize the way in which chemical mechanisms are studied and chemical reactions are improved. Single-molecule techniques will reveal reactivity distributions, which are obscured by traditional ensemble spectroscopic techniques, and will determine active catalysts by direct observation. The potential of single-molecule fluorescence microscopy to address diverse chemical questions, however, has not yet been realized. Previous methods for imaging covalent bond formation were limited to studying chemical reactions that destroyed or produced a fluorophore. We developed a spectator fluorophore imaging technique that does not have this limitation, and which will be generalizable to a large number of chemical reactions, providing unprecedented detail into reaction mechanisms and processes. The formation of individual Pt-S and Pd-P covalent-bonds were imaged on supports similar to those employed in recyclable heterogeneous metal catalysts. A variation in the number of bond-forming events over small surface areas revealed the heterogeneity of the surface's binding properties, which was obscured by traditional ensemble spectroscopy techniques. The application of this technique to the study of broad problems in catalysis will be discussed.

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