Probing the structure and properties of individual molecules on silicon surfaces

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Organic molecules mounted on silicon surfaces present unique opportunities for electronics, photonics, and sensing at the nanometer scale. To help elucidate the potential of organosilicon nanostructures, this talk will outline recent efforts to characterize and manipulate organic chemistry on silicon surfaces down to the single molecule level using ultra-high vacuum (UHV) scanning tunneling microscopy (STM) [1]. Specific topics will include templated assembly of heteromolecular organosilicon nanostructures using room temperature multi-step feedback controlled lithography [2] and molecular resolution characterization of cryogenic UHV STM driven organosilicon chemical reactions [3]. In an effort to identify the underlying physical mechanisms that control single molecule chemistry on silicon surfaces, the aforementioned experimental results will be quantitatively compared with density functional theory (DFT) calculations.

[1] E. T. Foley, N. L. Yoder, N. P. Guisinger, and M. C. Hersam, *Rev. Sci. Instrum.*, **75**, 5280 (2004).

[2] R. Basu, N. P. Guisinger, M. E. Greene, and M. C. Hersam, *Appl. Phys. Lett.*, **85**, 2619 (2004).

[3] N. L. Yoder, N. P. Guisinger, M. C. Hersam, R. Jorn, C.-C. Kaun, and T. Seideman, *Phys. Rev. Lett.*, **97**, 187601 (2006).