

MAR14-2013-020491

Abstract for an Invited Paper  
for the MAR14 Meeting of  
the American Physical Society

### **Dynamic Force Imaging and Spectroscopy of Individual Molecules**

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In atomic force microscopy (AFM) the qPlus sensor [1] facilitates the use of metallic tips, which are typically used in scanning tunneling microscopy (STM), and thereby facilitates combined STM and AFM experiments at cryogenic temperatures. The use of CO-functionalized tips as has been introduced recently by Gross and co-workers [2] enabled unprecedented resolution and thereby fostered the rapid recent development of the field. We made use of the complementary information that STM and AFM can provide in different contexts. When applied to STM-based single-molecule synthesis, the combination of these techniques enables a direct quantification of the interplay of geometry and electronic coupling in metal-organic complexes in real space [3]. Further, we combined STM on semiconductors with Kelvin probe force spectroscopy (KPFS) performed simultaneously in the same setup with the very same tip. This combination of tools allows us to experimentally recover the zero point of the energy scale usually being obscured due to so-called tip-induced band bending when measuring on surfaces of semiconductors [4]. Finally, we used KPFS with sub-molecular resolution to image the polarity of individual bonds.

[1] F. J. Giessibl, Appl. Phys. Lett. 76, 1470 (2000);

[2] L. Gross et al., Science 325, 1110 (2009);

[3] F. Albrecht et al., JACS 135, 9200 (2013);

[4] G. Münnich et al., Phys. Rev. Lett. 111, 216802 (2013).