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Single molecule and single atom sensors for atomic resolution imaging of chemically complex surfaces F. STEFAN TAUTZ, GEORGY KICHIN, CHRISTIAN WEISS, CHRISTIAN WAGNER, RUSLAN TEMIROV, Peter Gruenberg Institute (PGI-3),Forschungszentrum Juelich, Germany — To resolve single atoms has always been a major goals of surface science. Mapping forces with a dynamic AFM, it is possible to reconstruct atomic resolution of various surfaces and of large organic molecules[1]. At the same time scanning tunneling hydrogen microscopy (STHM) reaches atomic scale resolution and reveals intermolecular interactions with much less technical effort[2]. Besides H_2 and D_2, also individual Xe atoms, single CO and CH_4 molecules adsorbed at the tip apex of an STM function as microscopic force sensors that change the tunneling current in response to the forces acting from the surface. An STM equipped with any of these sensors is able to image the Pauli repulsion and thus resolve the inner structure of organic adsorbates. The more rigidly bounded CO yields the strongest, least distorted contrast. Thus, the sensor functionality can be tailored by tuning the interaction between sensor particle and STM tip. Hence, STHM belongs to a wider family of atomic-sensor microscopy techniques.
[1] L. Gross et al., Science 325, 1110 (2009)
[2] R. Temirov et al., New J. Phys. 10, 053012 (2008); C. Weiss et al., Phys. Rev. Lett. 105, 086103 (2010), C. Weiss et al., J. Am. Chem. Soc. 132, 11864 (2010); G. Kichin et al., J. Am. Chem. Soc. 133, 16847 (2011)

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