Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Quantifying molecule-surface interactions using AFM-based single-molecule manipulation F.S. TAUTZ, C. WAGNER, R. TEMIROV, N. FOURNIER, M. GREEN, T. ESAT, P. LEINEN, Forschungszentrum Juelich GmbH, Germany, A. GROETSCH, Federal Institute for Occupational Safety and Health, Dortmund, Germany, V.G. RUIZ, A. TKATCHENKO, Fritz-Haber-Institut der Max-Planck-Gesellschaft, Berlin, Germany, C. LI, K. MUELLEN, Max-Planck-Institut fuer Polymerforschung, Mainz, Germany, M. ROHLFING, Universitaet Muenster, Germany — Scanning probe microscopy plays an important role in the investigation of molecular adsorption. Promising is the possibility to probe the molecule-surface interaction while tuning its strength through AFM tip-induced single-molecule manipulation. Here, we outline a strategy to achieve quantitative understanding of such manipulation experiments [1]. The example of qPlus sensor based PTCDA molecule lifting experiments is used to demonstrate how different aspects of the molecule-surface interaction, namely the short-range adsorption potential [2], the asymptotic van der Waals potential [3], local chemical bonds which are the source of the surface corrugation [4], and molecule-molecule interactions [5] can be measured with SPM and interpreted by the help of force-field simulations.

[1] N. Fournier et al., Phys. Rev. B 84, 035435 (2011)
[2] C. Wagner et al., Phys. Rev. Lett. 109, 076102 (2012)
[3] C. Wagner et al., Nature Communications 2014 in press
[4] C. Wagner et al., Beilstein J. Nanotechnol. 2014, 5, 202
[5] M. F. B. Green et al., Beilstein J. Nanotechnol. 2014, 5, 1926.

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Date submitted: 14 Nov 2014 Electronic form version 1.4