

# **RIKEN Seminar**

## **理研セミナーのご案内**

**Date** : Nov. 10, 2011 (Thu) 14:00-

**Place** : Nano Science Bldg. 2F seminar room

(ナノサイエンス実験棟 2階セミナールーム)

**Speaker** : Dr. Pavel Jelinek

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**Title**: Force and current at atomic scale:  
do we sense the same entity?

Increasing number of precise simultaneous force/tunneling current measurements has been reported last years (see e.g. [1,2]). The possibility of combining the powerful tools provided by scanning tunneling (STM) and atomic force microscopy (AFM) in a single instrument brings an unique opportunity to correlate tip-surface short-range chemical forces with simultaneously measured tunneling currents at the atomic scale. This procedure provides entirely new way to characterize an established chemical bond between two nano-objects (atoms) not only the electron transfer but also strength of contact [3]. The new experimental procedure requires deep insight into the physical processes going on during the bond formation. In particular, it opens a new way to establish direct relation between fundamental physical entities, such as the tunneling current and the chemical force [4].

We combine STM/AFM measurements with DFT calculations to shed light on factors playing an important role in atomic contact formation such as (i) a structural relaxation; (ii) a modification of the electronic structure [5]; (iii) a collapse of the tunneling barrier; (iv) the importance of elastic multiple-scattering processes of electrons; and (v) modification of surface dipoles [6]. We will also briefly discuss molecular contrast using AFM/STM of simple molecules on the Si(111)-(7x7) surface.

[1] D. Sawada et al, Appl. Phys. Lett., **94**, 173117, (2009).

[2] F.J. Giessibl, Appl. Phys. Lett. **76**, 1470 (2000).

[3] M. Ternes et al, Phys. Rev. Lett. **106**, 016802 (2011).

[4] W. A. Hofer, and A. J. Fisher. Phys. Rev. Lett., **91**, 036803 (2003); C. J. Chen, Phys. Rev. Lett., **96**, 069701, (2006).; P. Jelinek et al (in preparation).

[5] P. Jelinek et al, Phys. Rev. Lett. **101**, 176101 (2008).

[6] S. Sadewasser et al, Phys. Rev. Lett. **103**, 266103 (2009).

走査トンネル顕微鏡(STM)と原子間力顕微鏡(AFM)の同時測定という新しい物質表面解析法について、最新の研究成果をお話していただきます。ぜひお越しください。

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