

## Single atom identification and manipulation using atomic force microscopy

(Yoshiaki Sugimoto)

### Abstract :

The ability for engineering nanostructures with unique and specific properties from the atomic or molecular level is a key technology for developing the next generation of novel nano-devices. We have developed the basic technology of both atom manipulation and chemical identification at room temperature by using Non-contact Atomic Force Microscopy (Fig. 1); a scanning probe technique based on the measurement of the force between a sharp tip and a surface, and therefore capable of imaging with true atomic resolution in any kind of surface. The ability to identify the local composition of a multi-element system at atomic level is based on precise measurements of the chemical bonding forces, which depend on the identity of the atoms involved [1]. On the other hand, a novel method for engineering nanostructures on surfaces at room temperature relies on an atomic interchange in the plane of a heterogeneous surface (Fig. 2); and the artificially created nanostructures using this method remain stable at the surface at room temperature for relatively long periods of time [2].

[1] Y. Sugimoto, P. Pou, M. Abe, P. Jelinek, R. Perez, S. Morita, and O. Custance, *Nature*, **446** (2007) 64.

[2] Y. Sugimoto, M. Abe, S. Hirayama, N. Oyabu, O. Custance, and S. Morita, *Nature materials* **4** (2005) 156.

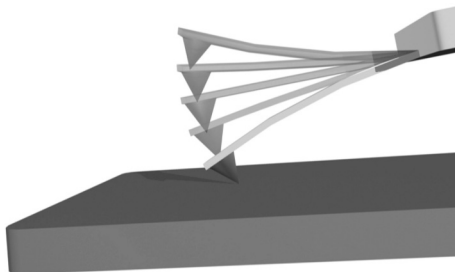


Fig.1

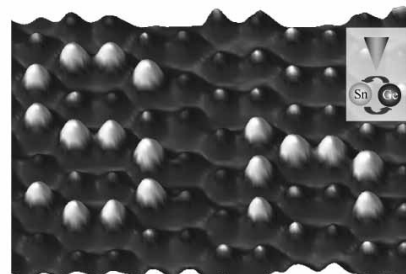


Fig.2