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The study of local dipole moment and contact potential difference on TiO₂(110) surface by AFM

Au/TiO₂(110) surfaces display extremely high catalytic reactivity. There are many representative models that explain the emerging catalytic activity of Au nanoclusters. It is widely accepted that the perimeter interface of Au/TiO₂ is the reaction site for CO oxidation. However, the injection/extraction mechanism of electrons and the reaction process are not clarified by a comprehensive experimental description. In this study, we proposed a new method to simultaneously measuring topography, local contact potential difference (LCPD) and dipole moment distribution on TiO₂(110) surface. In the experiment, the DC bias added with AC bias voltage is applied between the tip and sample. Three lock-in amplifiers are used to detect frequency shift of f_m , f_{2m} and f_{3m} . The contact potential difference is numerically calculated from the divided result of f_m and f_{2m} signals and dipole moment is obtained from frequency shift of f_{3m} . Figure 1 shows the result of topography, LCPD and dipole moment images on TiO₂(110) surface. The details will be reported in the meeting.

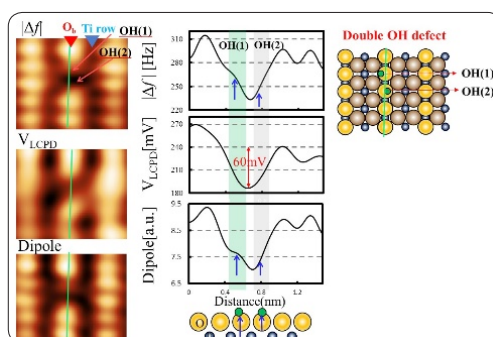


Figure 1: The simultaneously measurement result of topography, LCPD and dipole moment images on TiO₂(110) surface.

Recent Publications

1. J Bamidele et al. (2014) Vertical atomic manipulation with dynamic atomic-force microscopy without tip change via a multi-step mechanism. *Nature Communications*. 5:4476.
2. Y Naitoh et al. (2017) Sub-atomic-scale force vector mapping above a Ge(001) dimer using bimodal atomic force microscopy. *Nature Physics*. 13:663-668.
3. Y Kinoshita et al. (2016) Promoting atoms into delocalised long-living magnetically modified state using atomic force microscopy. *Nano Letters*. 16(12):7490-7494.
4. Y J Li et al. (2016) The origin of p(2x1) phase on Si(001) by NC-AFM at 5K. *Phys. Rev. Lett.* 96(10):106104.
5. H F Wen et al. Investigation of tunneling current and local contact potential difference on the TiO₂(110) surface by AFM/KPFM at 78 K. *Nanotechnology*. 28(10):105704.

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Biography

Y J Li has completed her PhD in 2001 from the University of Tsukuba, Japan. She worked at Institute for Molecular Science, Okazaki, National Research Institutes, Japan from 2001-2003; was a Visiting Associate Professor, Osaka University, Japan from 2004-2009. She currently works in the Department Of Applied Physics at the same university. She has published more than 83 papers in reputed journals.

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