FUKUTANI LAB.

[Science of surface and interface]

Department of Fundamental Engineering

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Surface and Interfacial Physics

Department of Applied Physics, Graduate School of Engineering

Dynamics of molecules at interfaces

▶ Overview

Surfaces and interfaces have different electronic states from those of bulk materials, since they have lower dimension and symmetry compared to the bulk. Thus, the surfaces and interfaces are expected to show anomalous properties, such as interface electric conductivity and catalytic activities. Particularly, surfaces play an important role in the formation, storage, and sensing of hydrogen that is a clean energy medium. In our laboratory, we are developing new experimental techniques to precisely observe hydrogen and investigating mechanisms of spin conversion and molecule formation using surfaces to make and understand functional surfaces.

▶ Research topics

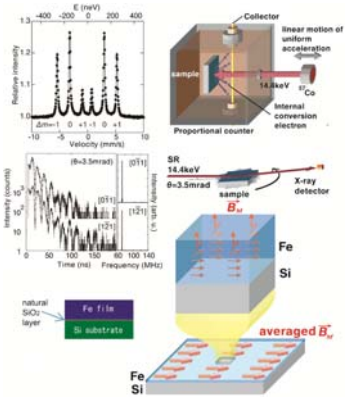
1 Design of functional interfaces

- ・Electronic state/magnetism/reactivity of metal nanostructures
- ・Electronic state/conductivity/reactivity of metal oxide surfaces（TiO_2,$SrTiO_3$,Cr_2O_3 etc.）
- ・Structure/phase transition/reaction of molecular layer
- ・Physics and control of excited states

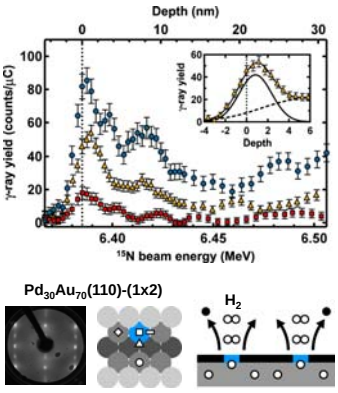
2 Hydrogen dynamics

- ・Nuclear spin conversion/energy dissipation
- ・Molecular hydrogen formation reaction
- ・Hydrogen transfer/storage in metal/nanotubes
- ・Hydrogen-induced surface conductivity
- ・Development of spin-polarized atomic H beam

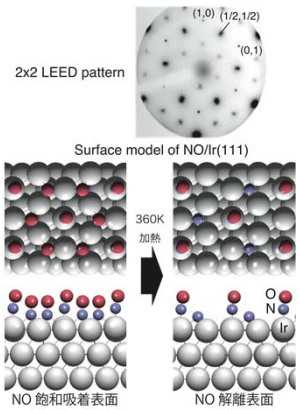
[Interface magnetism of Fe]



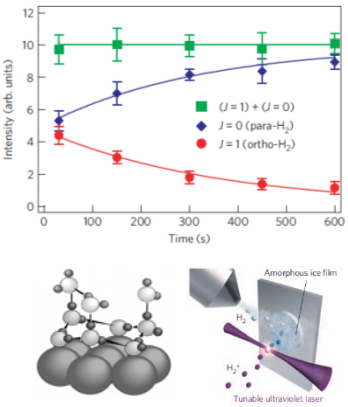
[H ab/desorption of PdAu]



[NO structure and reactivity]



[Nuclear-spin conversion]



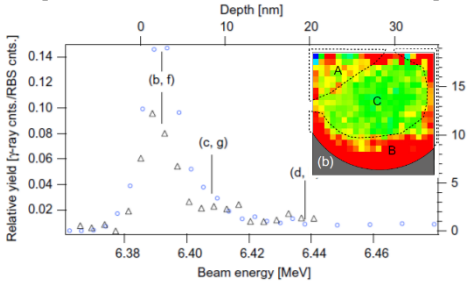
▶ Experimental techniques

[Hydrogen microscope]
Nanoscale measurement of 3D H distribution under atmospheric pressure

[REMPI]
Precise measurement of atoms and molecules

[STM・TDS・PES]
Measurement of surface structure/ electronic state/adsorption state

[H distribution of fractured surface]



[Rotational spectroscopy of H_2]