

FUKUTANI LAB.

[Science of surface and interface]

Department of Fundamental Engineering

<http://oflab.iis.u-tokyo.ac.jp>

Surface and Interfacial Physics

Department of Applied Physics, Graduate School of Engineering

Physics of Hydrogen and Surface

► 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. On the other hand, hydrogen is expected to be a clean energy medium, and surfaces play an important role in the hydrogen formation and storage. 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

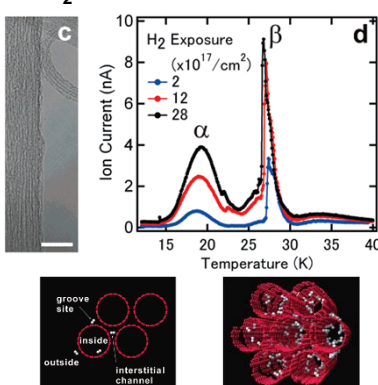
1 Hydrogen dynamics

- 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

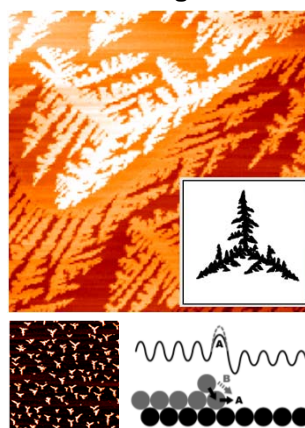
2 Design of functional interfaces

- Reactivities of Au nanostructures
- Carbon nanotubes
- Metal oxide nanostructures (TiO_2 , SrTiO_3 , Cr_2O_3 etc.)
- 1D, 2D molecular layers
- Physics and control of excited states

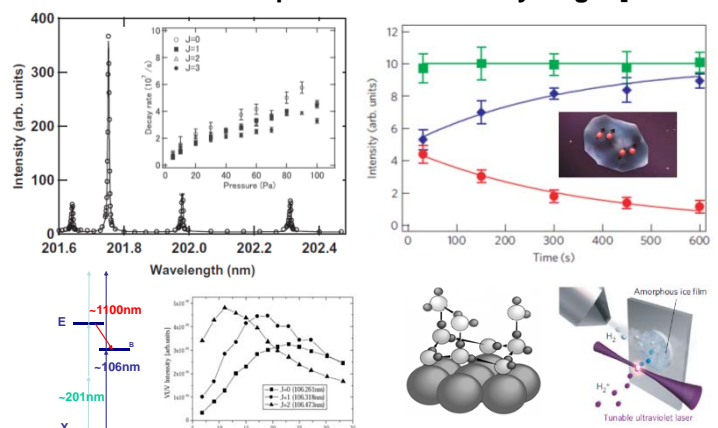
[H₂ in carbon nanotubes]



[Au fractal growth]



[Nuclear -spin conversion of hydrogen]



► Experimental techniques

[Nuclear Reaction Analysis]

Nanoscale measurement of 3D H distribution under atmospheric pressure

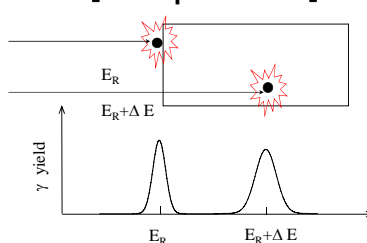
[REMPI]

Measurement of nuclear spin / internal state

[STM·LEED·TDS]

Surface structure / electronic state / adsorption states

[Principle of NRA]



[H distribution of fractured surface]

