

FUKUTANI LAB.

[Surface and Interface Science]

Department of Fundamental Engineering

Surface and Interface Physics

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

Controlling Electrons, Spins, and Protons at Surfaces

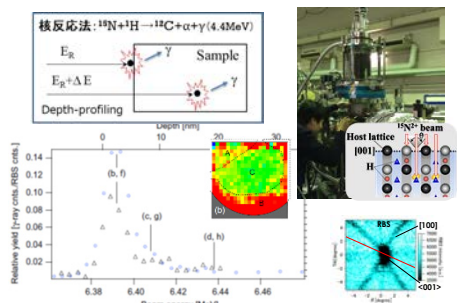
Overview

Surfaces and interfaces have different electronic states from those of bulk materials, because they have lower dimension and symmetry compared to the bulk. Thus, the surfaces and interfaces are expected to reveal particular 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 develop novel experimental techniques to precisely observe hydrogen in aimed at elucidating the mechanisms of proton transport, electron dynamics, spin conversion and molecule formation at surfaces, which leads to synthesis of novel functional surfaces.

Experimental Techniques

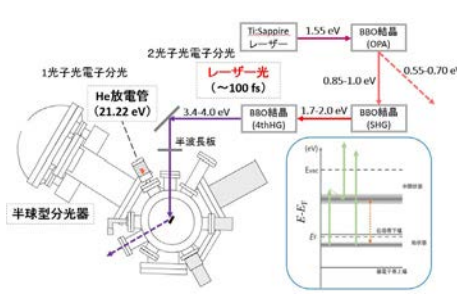
[Nuclear Reaction Analysis]

3D imaging of H in materials



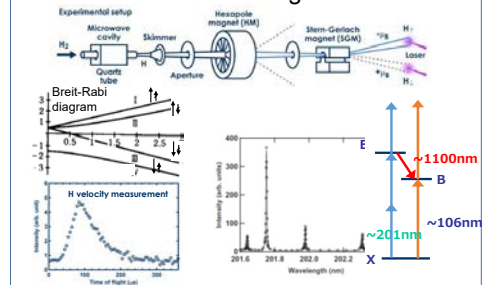
[(2-photon) Photoemission]

Electronic ground and excited states



[Spin-polarized H and Laser spectroscopy]

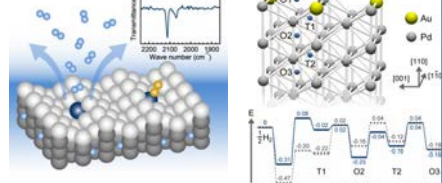
Spin conversion, rotational relaxation and surface magnetism



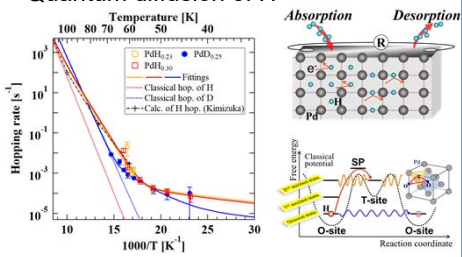
STM, Thermal desorption spectroscopy, Infrared absorption spectroscopy, etc.

Dynamics of protons, electrons, and spins

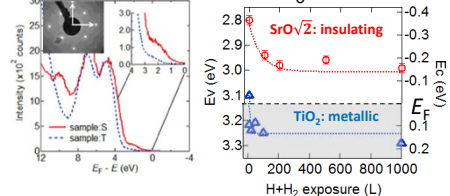
Control of H transport by surface modification



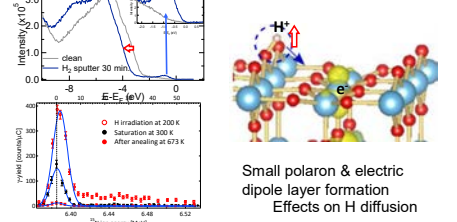
Quantum diffusion of H



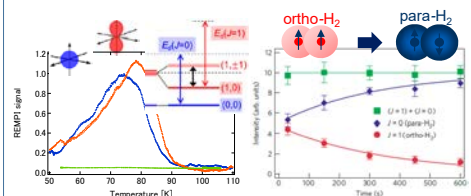
H-induced metal-insulator transition of SrTiO3



Proton-electron separation and H diffusion at TiO2



Hindered quantum rotation and nuclear-spin triplet-singlet transition



Magnetic canting at surfaces

