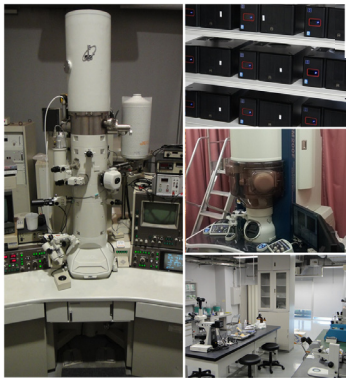
Mizoguchi Lab.

Institute of Industrial Science, Dept. Mater. Envi. Science

Nano-Materials Design Lab.

http://www.edge.iis.u-tokyo.ac.jp

Microscopy, Spectroscopy, and Calculation



Research in Mizoguchi Lab.

Much higher performance and higher reliability are now required to the materials to achieve further technology developments. In case of electroceramics, such as multi-layer ceramic capacitor and varistor, the size their grains in electric devices becomes smaller and smaller, ca. 1μm or less, and thus further property improvements of each grain and grain boundary are desired. To achieve this, clarification of atomic and electronic structures and finding the way to improve their properties are indispensable.

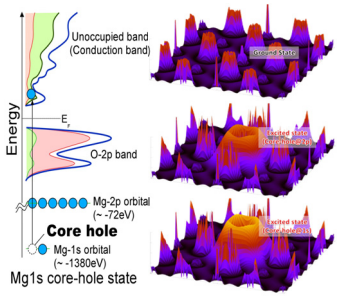
In our group, atomic and electronic structure analysis of materials are investigating by combining electron energy loss spectroscopy (EELS), transmission electron microscopy (TEM), and first principles calculation. By combining those methods, atomic and electronic structures and their relationships to materials properties can be unraveled. Particularly, superlattice, ionic liquid, Li-ion battery, Photovoltaic cell and electroceramics are investigated.

What kind of Structure?
How to bring about Property?

Property ⟷ Structure

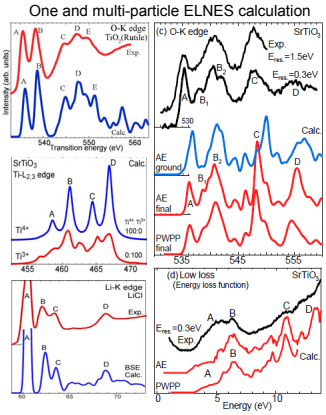
Relationship

Calculation and Application of Core-loss spectroscopy (ELNES/XANES)

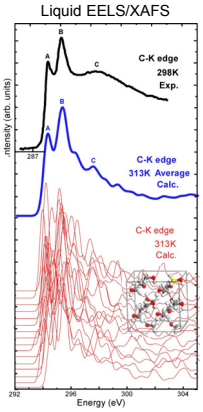


To calculate ELNES/XANES, core-hole, which is introduced in electron transition from core-orbital to conduction band, is indispensable. We are developing and applying theoretical ELNES/XANES.

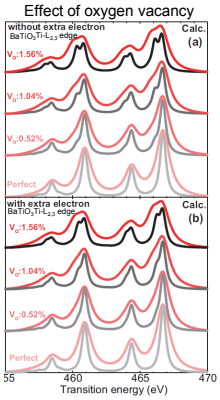
One and multi-particle ELNES calculation



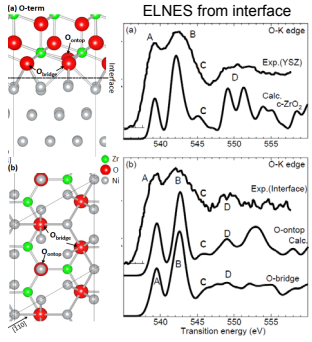
Liquid EELS/XAFS



Effect of oxygen vacancy



ELNES from interface



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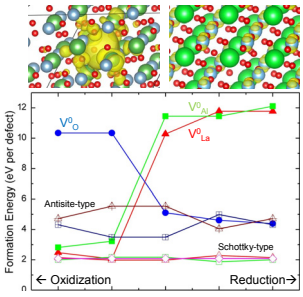
Defect Formation and Dynamics in Materials

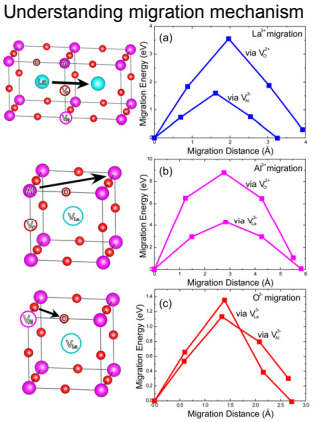
Understanding defect formation



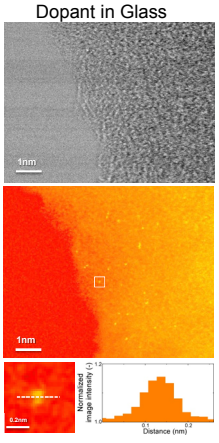
Diffusion and defect formation in materia influence functional and mechanical properties of materials.

We investigate those lattice imperfections using atomic resolution STEM-EELS and DFT calculation to pave the way for materials design.

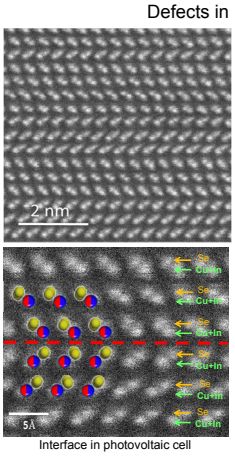
Understanding migration mechanism

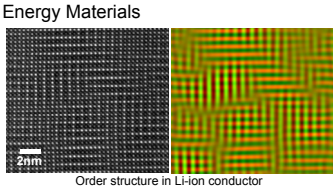


Dopant in Glass

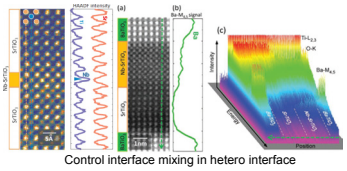


Defects in Energy Materials





Order structure in Li-ion conductor



Control interface mixing in hetero interface

Interface in photovoltaic cell

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