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VISIT our web site!

Develop energy and environmentally-conscious materials !

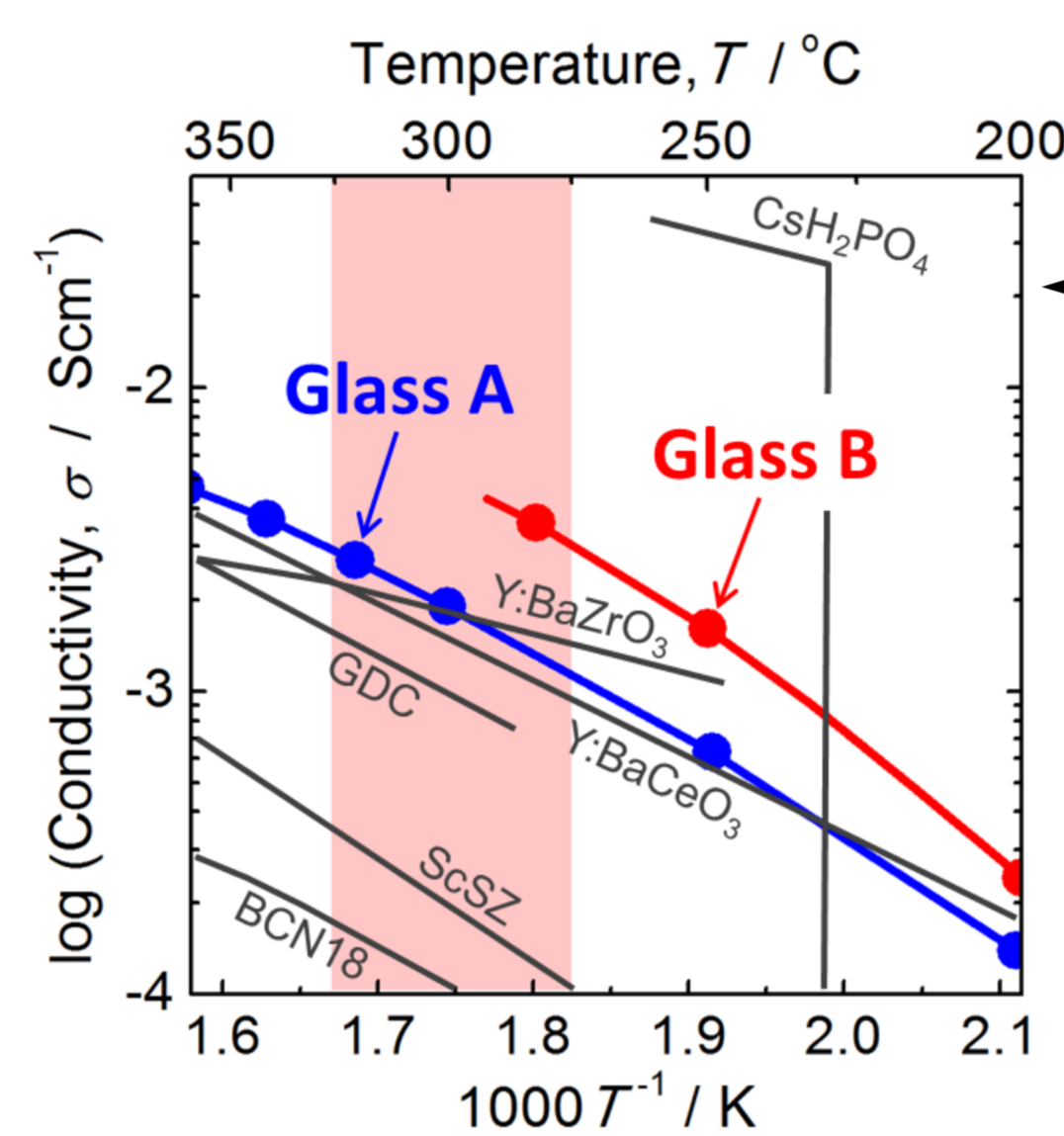
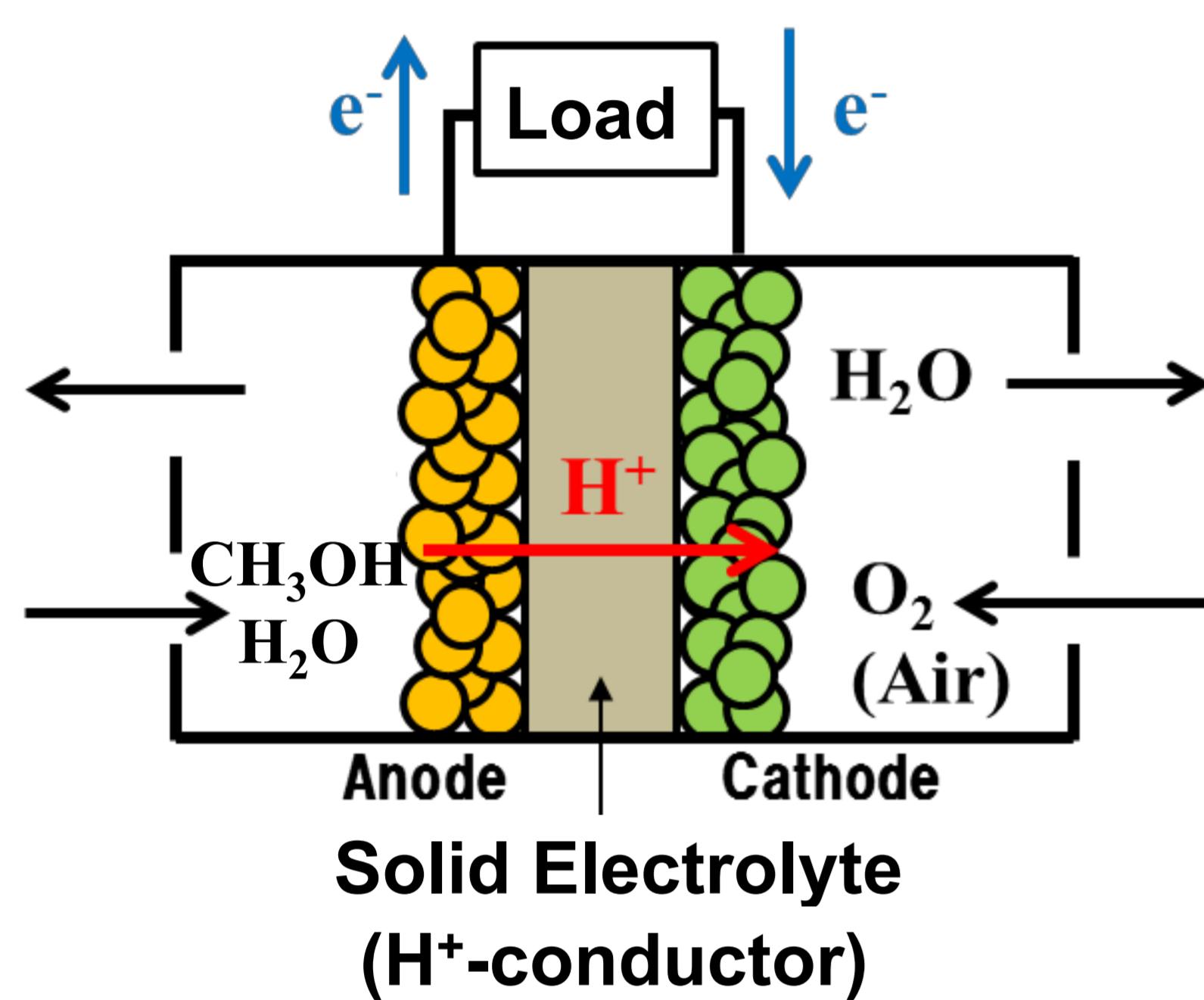
Most innovations have been triggered by advent of new materials, and the present energy, environmental and resource issues are expected to be solved by new materials. We focus on to explore new materials and their synthesis routes using ion-exchange and ionic intercalation techniques. Proton conducting phosphate glasses working at intermediate temperatures and narrow gap oxide semiconductors applicable to thin-film solar cells have been recently developed. Simple and safe synthesis routes to cadmium-free quantum dot phosphors and colloidal indium arsenide quantum dots for solar cells were also found out. Thin-film solar cells, fuel cells and light-emitting devices using those materials are now developing.

Theme 1 Biomass-based fuel cells (FCs) to achieve carbon-neutral society !

Bio-methanol FCs

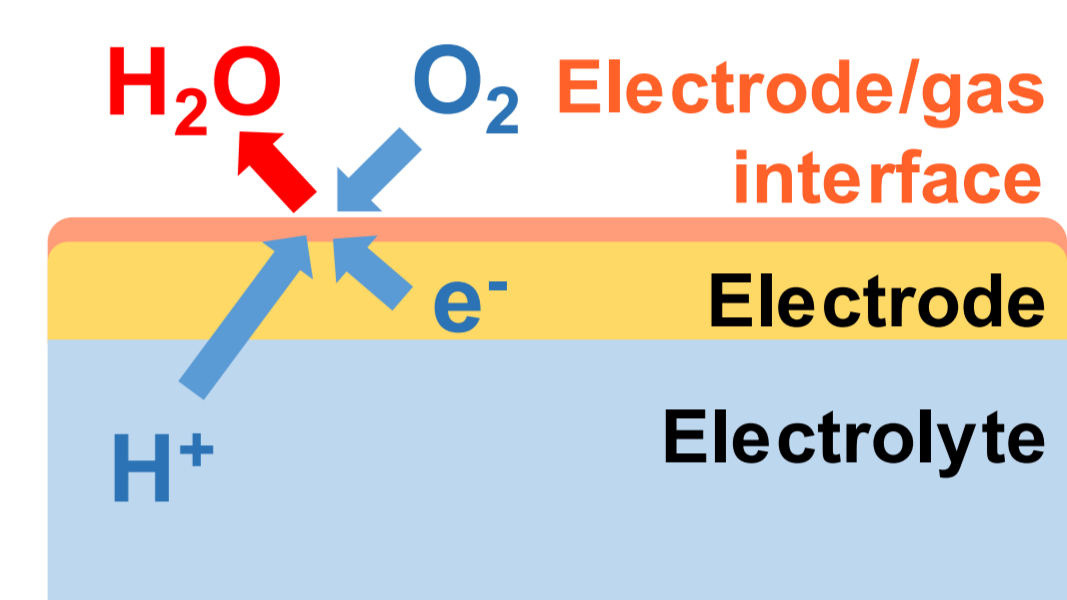
*Bio-methanol can be obtained from wood waste unlike bio-ethanol that is obtained from corn and soybean; it does not compete against food.

New solid electrolytes, H⁺-conductors, are required to materialize the bio-methanol



We have achieved world's highest-proton-conductivity at the temperatures where methanol FC works.

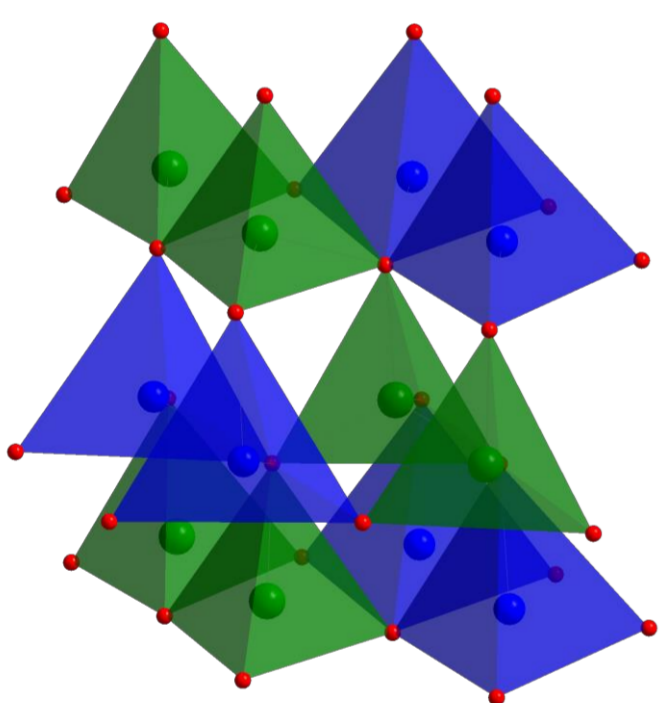
We are now developing new material for efficiently extracting current from methanol FC.



Theme 2 Solar cell consisting of eco-friendly materials !

Eco-friendly solar cells using non-hazardous and an abundant resources ••• Safe and low-cost solar cells

Our original material

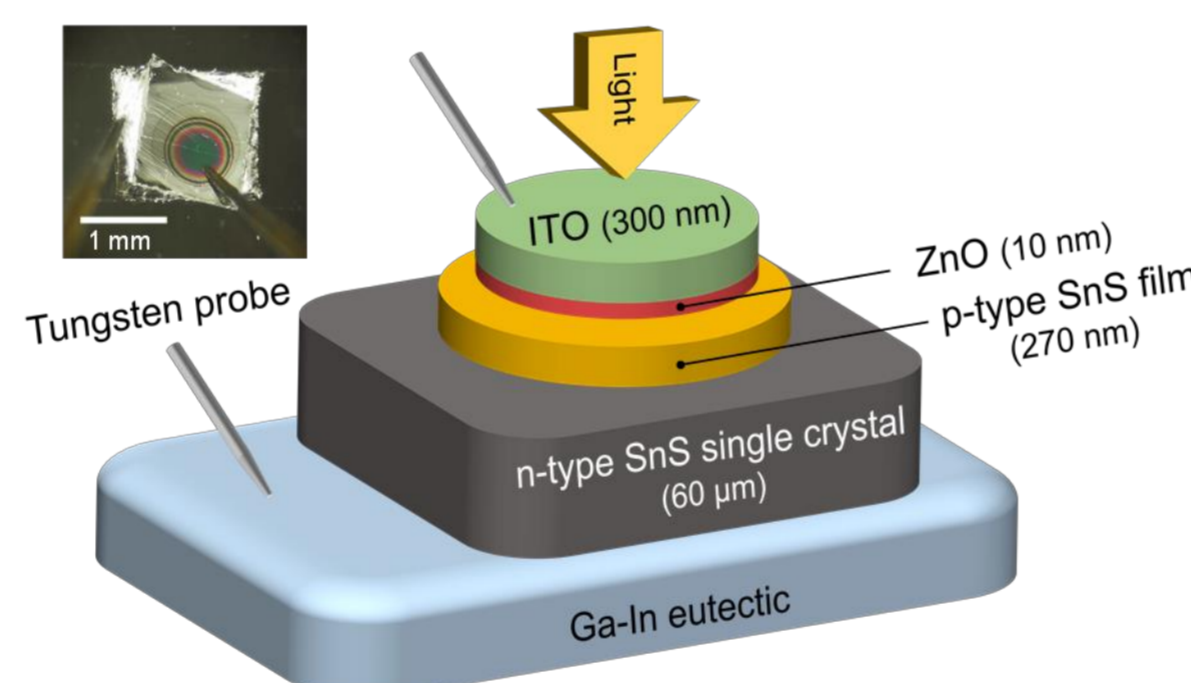


β -CuGaO₂

World's first n-type SnS film



World's first SnS homojunction solar cells



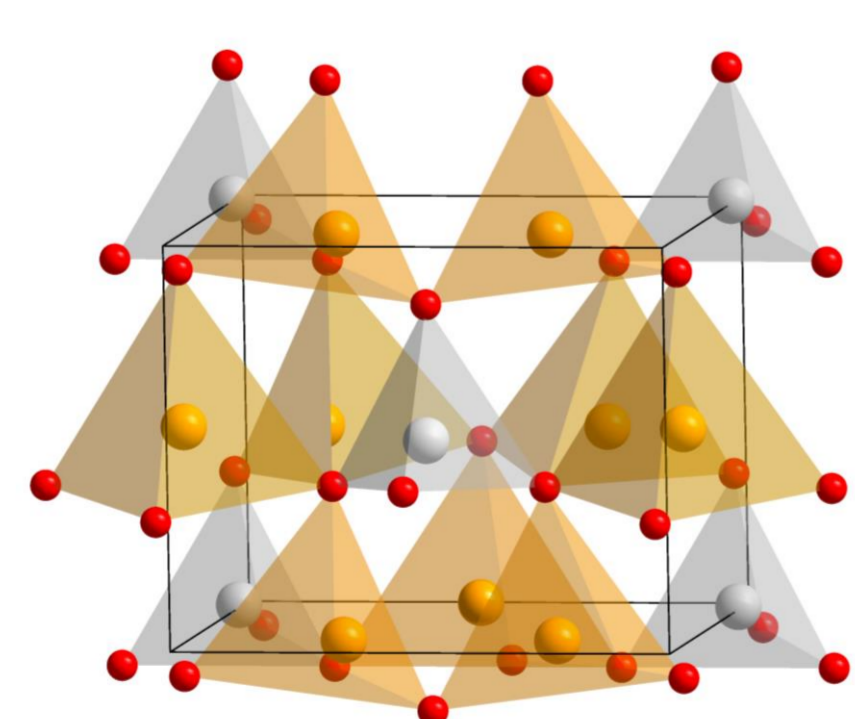
SnS

We are now developing thin-film solar cells using oxide semiconductor that was found in our laboratory.

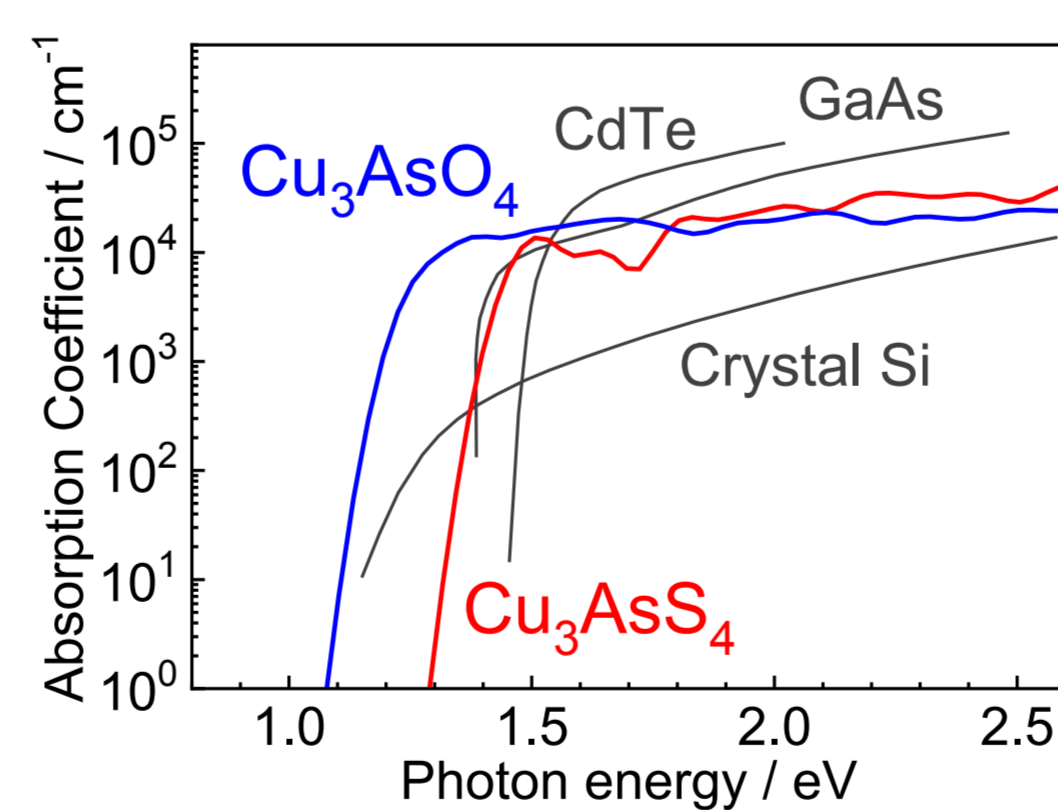
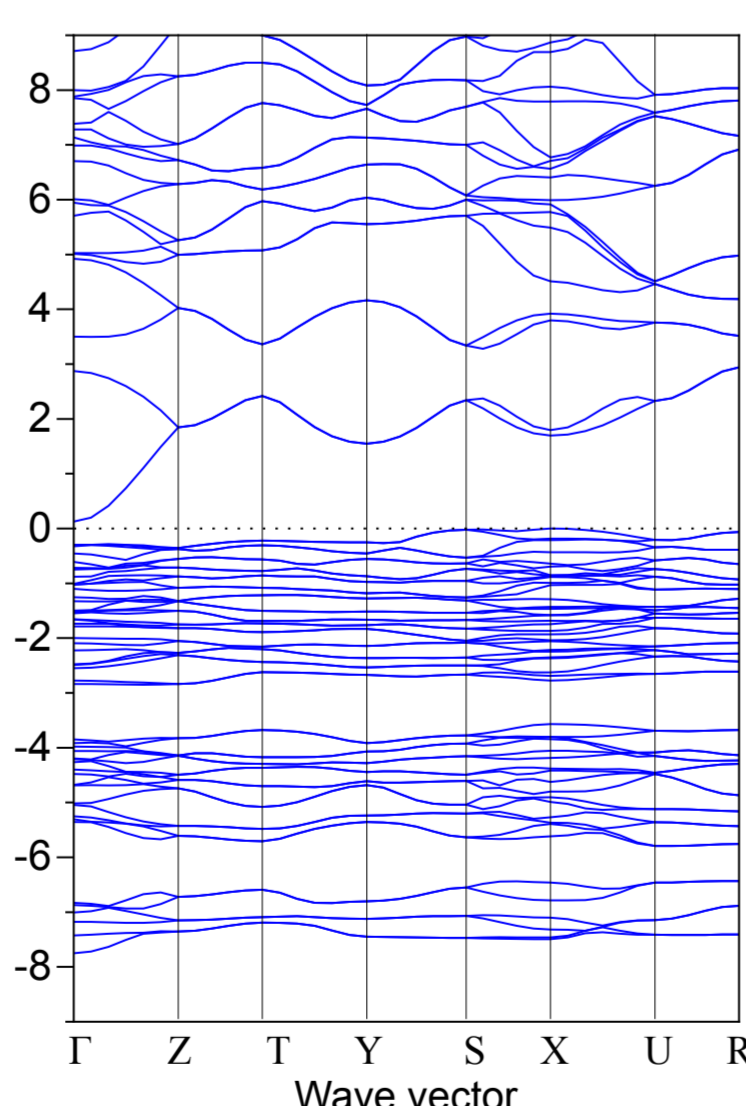


We aspire self-sufficiency in home electricity in 2030 !

Theme 3 Find outstanding materials by combination of elements!



Cu_3AsO_4
Solar cell materials



First-principles calculation

Infinite number of combination of elements from the periodic table...

We are exploring new outstanding material by understanding the properties of each elements and the characteristics of the crystal structures

Lab events



OB/OG place of employment

Tohoku Univ., AIST, JSPS, JR-West, Toray, TOYOTA, Hitachi Zosen, Toyama Murata Manufacturing, Sumitomo Electric Industries, UACJ, Mitsui Mining & Smelting, Sumitomo Metal Mining, Mitsubishi Materials, JX Nippon Mining & Metals, DOWA, Nihon Alps, NOHMI, Japan Aviation Electronics

Katahira campus



Feel free to contact us by e-mail (omata@tohoku.ac.jp) for further information on our laboratory!