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## Control Ion Conductivity in Molecular-based Framework Materials



### Satoshi Horike

*Institute for Cell-Material Sciences, Institute for Advanced Study,  
Kyoto University. Yoshida-Honmachi, Sakyo-ku, Kyoto 606-8501 JAPAN*  
*horike@icems.kyoto-u.ac.jp, <http://www.horike.icems.kyoto-u.ac.jp/>*

Solid-state ion conductors are significant class of materials for battery, fuel cell, electrocatalysis, and artificial ion channel, etc. Challenges are how to have fast ion conductivity, and how to switch the ion transport behavior by external stimuli in solid state.

Coordination Polymer (CP) or Metal Organic Framework (MOF) constructed from metal ions and bridging molecular ligands are promising materials for solid-state ion conductivity.<sup>[1]</sup> Some CP/MOF crystals offer anhydrous H<sup>+</sup> conductivity over 10<sup>-2</sup> S cm<sup>-1</sup> at 120 °C.<sup>[2]</sup> The performance meets the criteria of electrolyte materials for fuel cell vehicle. They also provide the switching ability of H<sup>+</sup> conductivity ON/OFF by light irradiation.<sup>[3]</sup> The switching of ion transport by light would contribute to the photo-induced battery system or electrochemical catalysis.

We also found some CP/MOF crystals show melting behavior or transformation to glassy state by thermal/mechanical treatments.<sup>[4]</sup> The organic/inorganic hybrid nature of these materials for solid-state ionics and glass science will be discussed.



Figure. Schematic illustration of H<sup>+</sup> switching by light irradiation in glassy CP: [Zn(H<sub>2</sub>PO<sub>4</sub>)(HPO<sub>4</sub>)] [Imidazole] with doped pyranine.

### References:

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