Development of novel crystalline porous materials for energy storage applications

Our group is responsible for the development of porous organic materials as covalent organic frameworks (COFs) in the direction of energy storage applications over the world. COF is a type of porous crystalline material whose ease of preparation, functionality, and modularity make it a powerful platform [1] for the development of molecular devices in many (bio)engineering fields, including energy storage [2] such as battery [3] and fuel cell (Figure 1), environmental remediation, drug delivery, and catalysis.

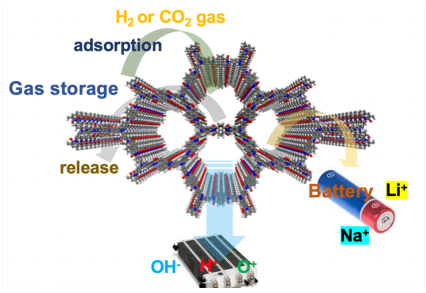

Figure 1. Main target applications of porous materials containing COFs.

Recently, our group is interested in development of novel ionic COFs (iCOFs) that are highly useful for constructing energy devices, as their ionic functional groups can transport ions efficiently, and the nonlabile and highly ordered all-covalent pore structures of their backbone provide ideal pathway for long-term ionic transport under harsh electrochemical conditions. Therefore, they exhibit proton conductivities via space channels and find applications for their proton-conductive fuel cells.

References: 1. Nagai, A. "Covalent Organic Frameworks" Pan Stanford Publishing, published this book in **2020** (ISBN: 978-981-4800-87-7). 2. Nagai, A. et al. *Angew. Chem. Int. Ed.* **2012**, *51*, 2612, *Angew. Chem. Int. Ed.* **2013**, *52*, 2017, *J. Am. Chem Sci.* **2013**, *135*, 546. 3. Nagai, A. et al. *Chemistry of Materials*, **2021**, *33,* 818, 4.