**Link:** <https://solar-power-tech.com/e-posters/sfs_eposter_05/>

**Abstract**

Photocatalytic CO2 reduction into value-added chemicals under solar light is gaining a lot of attention to address the greenhouse gases and fossil fuel depletion problem. To fulfill the increasing demand of energy and to reduce environmental pollution, one effective method is to convert CO2 into methanol. Highly efficient photocatalysts play an important role in photocatalytic CO2 reduction. Research on metal-organic frameworks (MOFs) for photocatalytic applications have exploded in the last few years. MOFs are usually modified with a wide selection of materials, which enhances its photocatalytic activity and selectivity. Prominent examples include metals and metal oxides such as TiO2, Cu, Zr, and Zn. The large surface area, well-ordered structure, and tunable chemical composition make MOFs promising for photocatalytic applications. The most common method of MOFs synthesis is solvothermal method, although several other methods are also widely known such as electrochemical, mechanochemical, and sonochemical [1, 2]. The water intolerant characteristic of MOFs can lead to photogeneration of electrons because the organic linkers are not excited effectively. The choice of organic linker, metal clusters and modifications to MOF also affect the selectivity and yield of the product. Many types of MOFs have been used for CO2 reduction, such as HKUST-1, ZIF-8, and UiO-66, but specific use for photoreduction to methanol is still limited and has not been fully explored. Goyal et al. (2018) captured and reduced CO2 to methanol using a copper-modified zeolitic imidazolate (Cu/ZIF-8) based MOF [3]. With Cu/ZIF-8, they reported seven times higher methanol production activity than porphyrin-based MOFs highlighting CO2 adsorption onto Cu2+ surfaces. As the field of MOFs catalysis matures, it becomes increasingly clear that MOFs will hardly replace other more conventional catalysts (such as mineral acids and bases, metal salts and complexes, or zeolites) for the synthesis of bulk chemicals, especially in processes that do not require highly specific catalysts. These catalysts are usually cheaper and/or more stable than MOFs and will certainly be the choice of industry. Further research work is still needed on the application of MOFs for selective photoreduction of CO2 to methanol. It is expected that due to the unique properties of MOFs, when combined with other semiconductor materials, it will produce superior texture and morphological properties of composites or heterostructures.