Molecular Designed Solid Catalysts for Energy Applications

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Our lab is interested in designing solid catalysts with molecularly defined structures and local environment for energy applications including photocatalytic and electrocatalytic water splitting and CO_2 reduction. The insights obtained from uncovering the origin of the active sites and structure-activity correlation benefit the rational catalyst design to achieve high catalytic performances [1-7]. For example, cobalt phosphonate based metal-organic frameworks (MOFs) were synthesized to tune the metal-metal and metal-ligand distances. The resultant catalysts demonstrate high performances for photocatalytic [2] and electrocatalytic [3] oxygen evolution reaction (OER). A review article was recently contributed by our group to summarize the recent key progress achieved including our own works in designing MOFs and COFs based molecular solid catalysts and the mechanistic understanding of the catalytic centers and associated reaction pathways for a broad range of reactions [7].

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