Design of Metal-Organic Polyhedra for Photocatalysis

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Development of highly active, selective, and long-lasting catalyst is sought-after demand in both heterogeneous and homogeneous catalysis. Molecular photocatalysts, having powerful features of high activity and product selectivity, have been challenged concerning their catalytic stability as they are easily transformed to inactive form and not reusable. In this report, we discovered that a discrete molecular cage of metal-organic polyhedra (MOP), structured with organic linker and inorganic joint, ultimately stabilize a molecular catalyst without losing its original catalytic activity. The molecular catalyst chemically bound to MOP preserved its high CO2-to-CO conversion activity up to 24 hours under visible light, while its molecular form was deactivated in 2 hours. These high catalytic activity and stability are coming from the nature of MOP existing in the intermediate regime between discrete molecules and extended structures, thus combining the advantages of both homogeneous and heterogeneous catalysts.