

## Abstract

In this work, we report the design of a two-dimensional (2D) isostructural metal-organic framework containing Pd(II) active sites, using a bipyridyl dicarboxylate linker ( $\text{Mg}(\text{bpdc})(\text{DMF})_2\text{PdCl}_2]_n$  (Pd@Mg:JMS-2) and  $[\text{Mn}(\text{bpdc})(\text{DMF})_2\text{PdCl}_2]_n$  (Pd@Mn:JMS-2)). The activated MOFs Pd@Mg:JMS-2a and Pd@Mn:JMS-2a were evaluated as heterogeneous catalysts for the hydrogenation of carbon dioxide ( $\text{CO}_2$ ) to formate. Under optimal conditions, the MOFs exhibited impressive catalytic activity with formate turnover numbers of 7272 and 9808 for Pd@Mg:JMS-2a and Pd@Mn:JMS-2a, respectively, after 24 h. These catalysts exhibited higher catalytic activity when compared to its homogeneous counterpart that was used as a linker during MOF synthesis. Post-experimental characterization showed that the structural integrity of the MOFs was not altered after catalysis. This work demonstrates that the catalytic activity of homogeneous systems can be enhanced under heterogeneous conditions by anchoring them on MOFs.