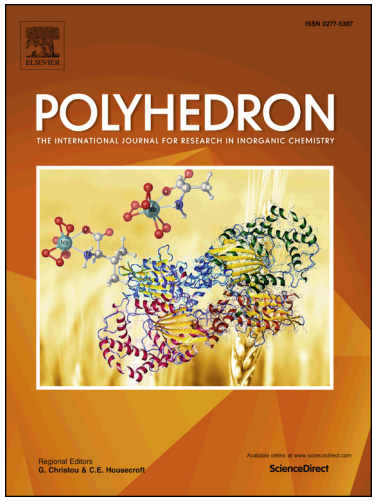

Nanometer-Scaled Iridium Particles Gas-Phase-Loaded into the Pores of the Metal-Organic Framework MIL-101

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Nanometer-Scaled Iridium Particles Gas-Phase-Loaded into the Pores of the Metal-Organic Framework MIL-101

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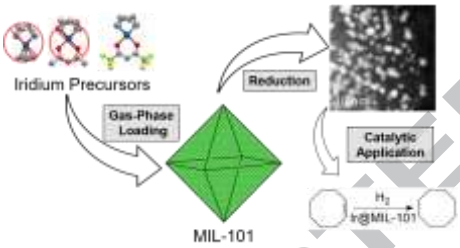
Abstract

The controlled gas-phase loading of a metal-organic framework (MOF) to generate iridium nanoparticles is described. The key is the use of an Ir complex, which was small enough to fit through the pore apertures of the MOF, stable enough to be vaporized and labile enough to be reduced inside the pores of the MOF. Homogenously distributed, nanometer-sized and highly crystalline iridium nanoparticles, located inside the pores of the still intact host matrix of MIL-101 (Cr) could be generated. The material was characterized using electron microscopy, X-ray diffraction, elemental analysis and nitrogen physisorption techniques. Initial catalytic tests showed a high activity in olefin hydrogenation.

Graphical Abstract & Synopsis



A suitable iridium complex or precursor for the gas phase loading of metal-organic frameworks has been identified. Loading and reduction/decomposition of the precursor could be carried out without destruction of the host matrix MIL-101(Cr). Nanosized, cavity-conform iridium nanoparticles located inside the pores were obtained, showing a high catalytic activity in olefin hydrogenation.

Keywords

Catalysis, gas phase loading, hydrogenation, iridium, metallic nanoparticle, metal-organic framework, MOCVD, MOF, precursor, reduction, stabilization