Catalytic carpets: Pt@MOF@electrospun PCL, a surprisingly active and robust hydrogenation catalyst

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Since the discovery of Metal Organic frameworks, they have been utilized in a variety of applications for example as support material for homogeneous metal complexes and nanoparticles[1]. Despite their interesting properties, their practical application has been limited due to issues concerning leaching, low recyclability and material handling. To overcome these issues MOFs have been deposited onto various types of scaffold materials such as alumina and silica[2,3]. However, MOF deposition on polymer- based scaffolds for catalysis remained a rather limited and unexplored field despite their good mechanical and chemical stability. In this study we report on the embedding of Pt@MIL-101 in a poly-ε-caprolactone (PCL) matrix by means of electrospinning to create a catalytic carpet (see Figure 1)

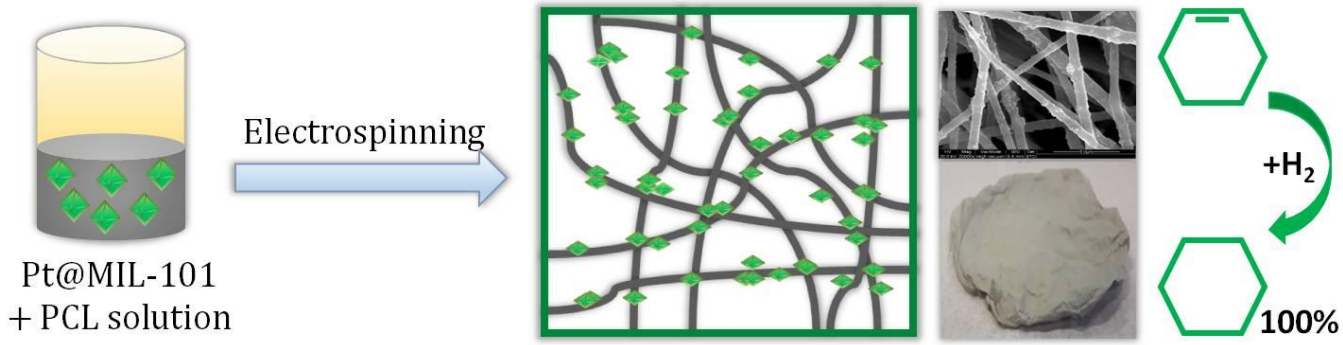

Figure 1: Use of the obtained catalytic carpet in the hydrogenation of cyclohexene

The hydrogenation of cyclohexene was used as a proof of concept to examine the catalytic activity of the Pt@MIL-101/PCL catalytic carpet. The Pt@MIL-101/PCL exhibits complete conversion of cyclohexene after 90 minutes of reaction. Remarkably, a very large fraction (>65%) of the total Pt-atoms participate in the reaction. Reusability tests showed that the material could be recycled for at least 4 runs without detectable Cr and Pt leaching displaying the durability of the catalytic carpets. Complete recovery is achieved with zero weight loss while fully preserving the crystalline structure.

References:

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