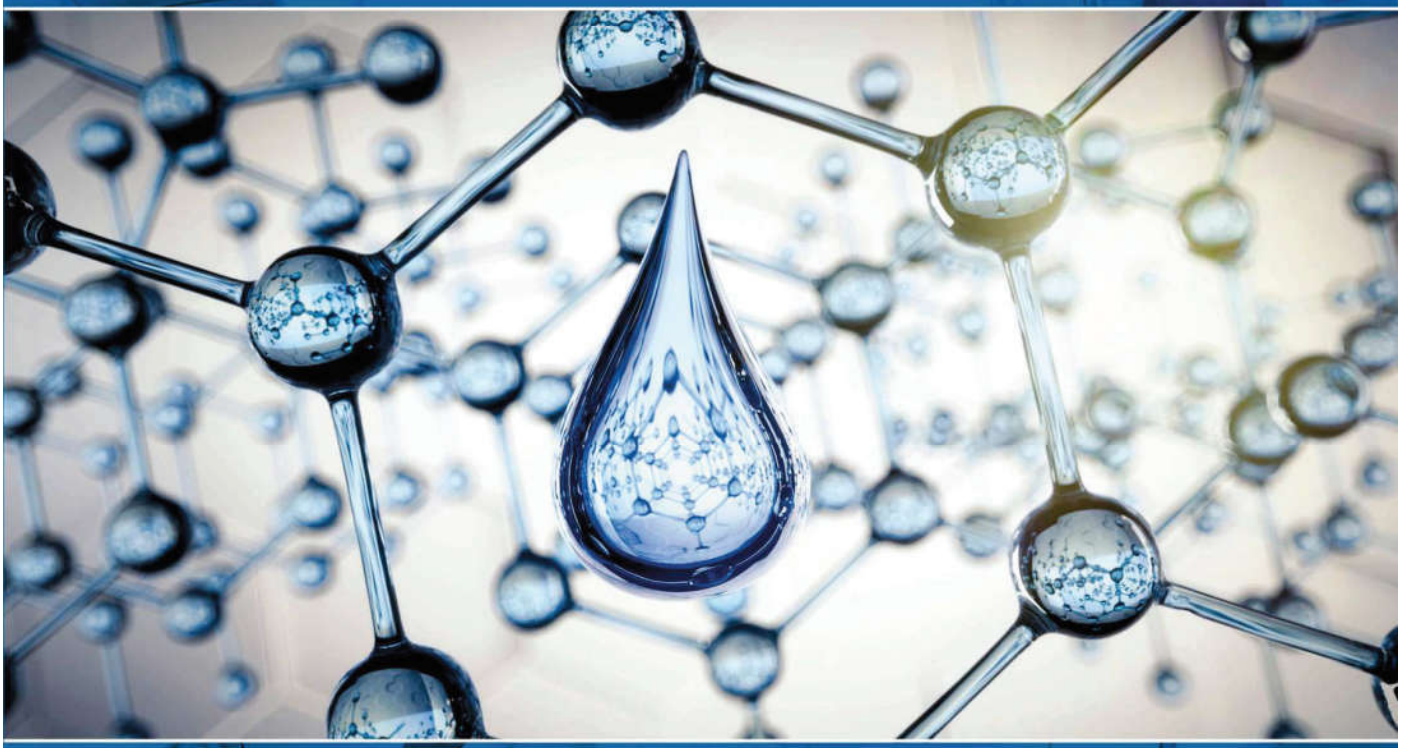
SYNTHESIS OF METAL-ORGANIC FRAMEWORKS VIA WATER-BASED ROUTES

A green and sustainable approach



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Chapter 2

Fundamentals of metal–organic frameworks

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2.1 Introduction

Metal–organic frameworks (MOFs) have seen extraordinary attention from the scientific audience over the past three decades due to their fascinating properties playing a key role in their potential applications. These MOFs are porous crystalline solids or porous coordination polymers (PCPs) which are constructed by metal sites and organic or inorganic building blocks (metal ions or clusters) as their basic representatives of coordination polymers. During this course of time in the past few decades, they have received tremendous research attention from people of different domains due to their high surface area, permanent porosity, controllable morphology, tunable chemical properties, and flexible chemical structure [1]. They are structurally made up of metal ions or metal clusters which are further linked by organic ligands or other similar structures into cage-like network structures often exhibiting permanent porosity [2] and also imparting new bulk properties [3]. Their tendency to exhibit an unprecedented degree of tunability has given them a superior selection where other materials have failed. This has led to newer advances and further developments of new structures with improved features paving a brighter way for new emerging potential applications as selective catalysts in organic synthesis particularly heterogenous catalysis by overcoming the non-neglectable issues arising from contemporary organic synthesis [4].

Apart from the established synthetic procedures which may or may not be oriented towards a greener approach, an elated technique needs to be developed to overcome the disadvantages of the traditional techniques including reduction in the environmental costs, energy, and the need for toxic organic solvents which consequently reduce the production cost. The development of these greener and safer pathways attaining the goal of a sustainable approach is the need of the hour. In the current scenario, many directional efforts have been made to follow alternate pathways that lead to the minimal generation of hazardous organic solvents in the synthesis of MOFs through solvent-free methods, aerosol

Synthesis of Metal–Organic Frameworks via Water-Based Routes: A Green and Sustainable Approach.
DOI: https://doi.org/10.1016/B978-0-323-95939-1.00012-5