

Designing, Synthesis, and Applications of Covalent Organic Frameworks (COFs) for Diverse Organic Reactions



Shefali Shukla, Abhay Gaur, and Shikha Gulati

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Abstract Covalent Organic Frameworks (COFs), a new emerging class of crystalline porous materials fabricated by connecting the organic building blocks with strong covalent bonds to form extended structures. COFs are amongst the few synthetic superstructures which have a highly crystalline nature thus leading to ordered and well-arranged pores which are easy to characterize through common analytical techniques like Brunauer–Emmett–Teller (BET) and Powder X-Ray Diffraction (PXRD). COFs have emerged as an important and fascinating research topic in the last one and a half decades owing to their lower density, large surface area, versatile and robust nature due to strong and intact covalent linking, and easy-to-tune pore size. Thus, crystalline porous structures, with long-range orderliness and larger surface area, have made these functional-tailored materials attractive to the present researchers for the development of promising catalytic materials. COFs can act as nanoreactors which reduce the activation energies of the reactants by bringing them closer and providing the proper environment to react. Being light and insoluble in many solvents, they form an ideal contestant for heterogeneous catalysis. COFs are an excellent host to the metal NPs with minimum aggregation for effective cooperative catalytic activity. In the present chapter the basic concepts used in designing, the recent advancements in the field of synthesis, and the properties shown by these structures are discussed in detail. Furthermore, the applications of these highly porous catalysts in diverse organic transformations are described.

S. Shukla (✉) · A. Gaur · S. Gulati

Department of Chemistry, Sri Venkateswara College, University of Delhi, Delhi 110021, India

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