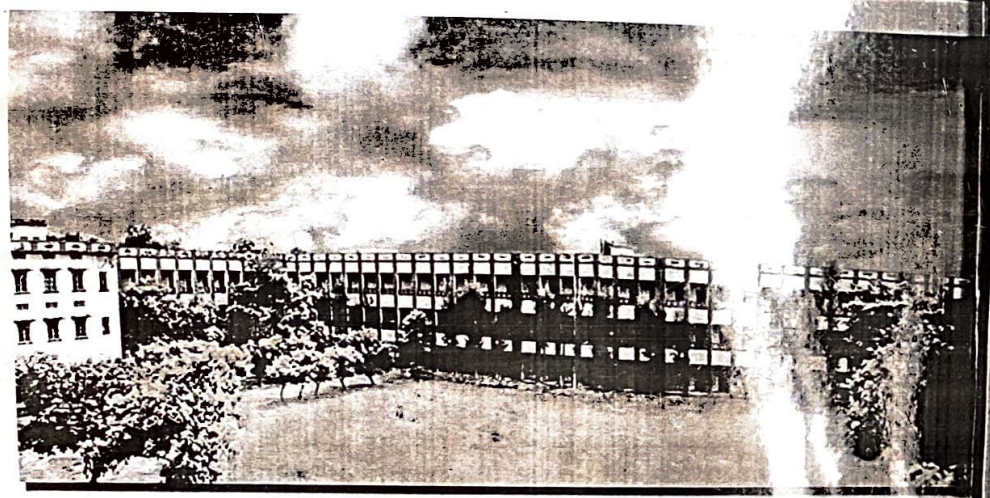

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Metal Organic Frameworks (MOFs) as Electro catalysts for Oxygen Evolution Reaction (OER), Hydrogen Evolution Reaction (HER): A Brief Review

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Abstract

Metal-organic frameworks (MOFs) with high surface area and tunable chemical structures have attracted tremendous attention. Recently, there has been increasing interest in deriving advanced materials from MOFs for electrochemical energy storage and conversion. This progress report highlights recent breakthroughs in electrocatalysis by using MOF-based novel catalysts, such as in oxygen reduction and evolution, hydrogen evolution and carbon dioxide reduction. The advantages of preparing electrocatalysts from MOFs are introduced and discussed. Then, the development of MOF derived lectrocatalysis-active products, such as heteroatom-doped carbon, metaloxide (MO), metal sulfide (MS), metal carbide (MC), metal phosphide (MP)and their hybrids with carbon, are summarized. The detailed functions of these materials in representative electrocatalysis systems are also reviewed.

Introduction

The hydrogen evolution reaction (HER), and oxygen evolution reaction (OER) are the key half-cell reactions involved in electrochemical water splitting. It is necessary to use Pt/Pt alloys for kinetically sluggish oxygen reduction reaction (ORR). Due to its high cost and poor stability, the exploration of an alternative designing, highly efficient non-noble metal catalyst has been received great interest. Metal organic frameworks (MOFs) is a porous crystalline material has revealed potential application in clean energy field and advantages like their high surface area, permanent porosity and abundant metal/organic species. MOF have been widely studied and applied in many field such as adsorption/separation, drug delivery, catalysis, magnetism, ion conduction etc. The first MOF based hydrogen storage was studied by Rosi et al. in 2003 [1]. Recently, newly emerging MOFs material have been used as template and / or precursors to fabricate porous carbon and related functional nanomaterials, improves excellent catalytic activity towards OER, HER, and ORR. The direct application of MOFs as electrocatalysts was first reported in 2011 by Nohra et al, [2] who pointed the use of polyoxometalate– based MOFs (POMOFs) for the HER. Because of the large variation of organic moieties highly nanoporous carbon –metal /metal oxide composites from MOFs are used as electrocatalyst for the HER and OER. Compared with