Metal organic framework: Cobalt based porous co-ordination polymer as supercapacitor electrode with neutral and alkaline electrolytes

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1. Introduction

The metal organic framework (MOF) are burgeoning as they can be tailored and tuned according to the required applications. The MOFs are being employed in various fields and evaluated as metal and organic linkers with their crystal and porous nature makes it viable in all fields ranging from solar energy, electrocatalysts to proton conductors and electrochemical energy storage applications [1-3]. MOF when explored intensively, lead even to the water production from desert atmosphere being a potential development. Hence exploration leads to varied application to discover more and implementation in innumerous fields. In this work, we have studied the role of cobalt based porous co-ordination polymer as supercapacitor electrode and evaluated with neutral and alkaline electrolyte.

2. Work abstract

The Cobalt based MOF are explored for their magnetic property and axial arrangement with difference linkers are studied in batteries, catalytic and supercapacitor applications. Very few reports are available for the direct utilization of MOF as electrodes. In this Cobalt based porous coordination polymer, we have utilized trimesic acid (benzene tricarboxylic acid) as the linker. The MOF obtained are synthesized via facile hydrothermal method with the solvents of dimethyl formamide and ethanol. The structural analysis with X-Ray Diffraction and morphological analysis by FE-SEM are performed and evaluated as supercapacitor electrode with the electrochemical analysis. The alkaline electrolytes of potassium hydroxide (KOH) and lithium sulphate (Li_2SO_4) are used. The electrodes were prepared by Cobalt based MOF: activated carbon: PVDF in the ratio of 85:10:5 and slurry was coated on the stainless steel as current collector. The Cyclic Voltammetry, galvanostatic charge discharge analysis with alkaline and neutral electrolytes are performed. Hence the conversion in electrochemical performance for the cobalt based MOF with both electrolytes are studied in this work.

3. Morphological analysis of the Cobalt based MOF

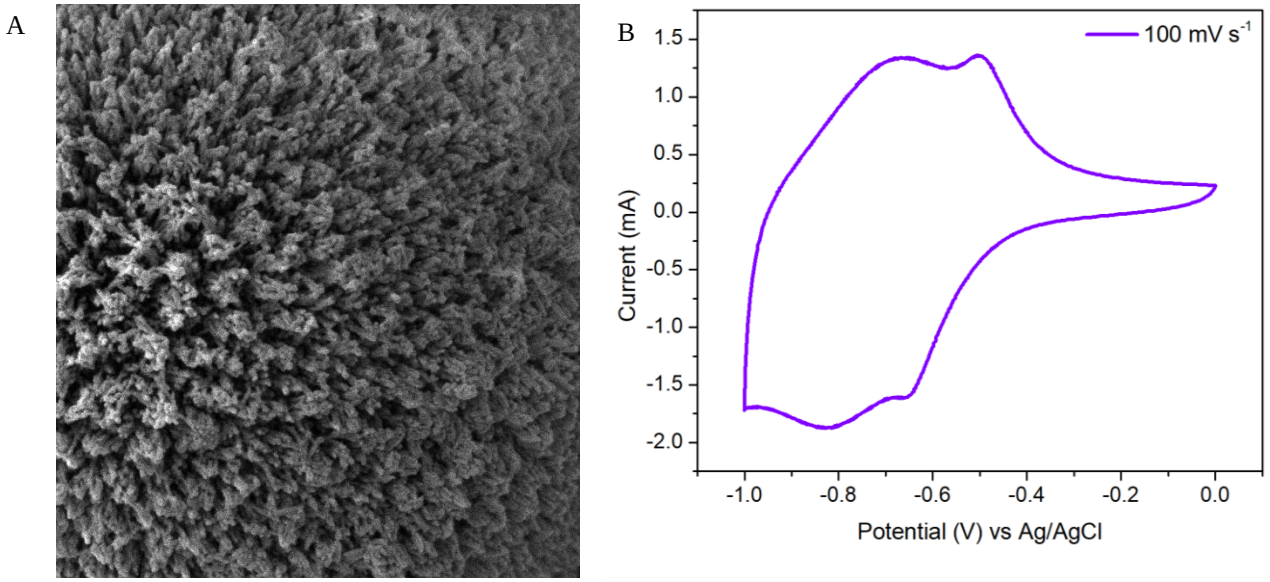

Fig. 1(A) FE-SEM image of Cobalt based MOF, (B) Cyclic Voltammogram of Cobalt based MOF with neutral electrolyte.

3.2 Electrochemical characterization

The electrochemical performance of electrode is done with lithium sulphate and potassium hydroxide. The reports on this MOF have widely utilized KOH electrolyte but we have attempted to characterize its performance with the Li_2SO_4 electrolyte. The contribution of Li ions for intercalation and de-intercalation is observed from the cyclic voltammogram. Hence, we have performed with the electrolytes of neutral lithium salt and the contribution of pores in the electrode's paves way for movement of lithium ions.

Acknowledgment

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