

Synthesis of Amine Functionalized MOF-74 for Carbon Dioxide Capture

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Abstract : Scientific studies suggested that the incremented greenhouse gas concentration in the atmosphere, particularly of carbon dioxide (CO₂) is one of the major factors in global warming. The concentration of CO₂ in our climate has crossed the milestone level of 400 parts per million (ppm) hence breaking the record of human history. A report by 49 researchers from 10 countries said, 'Global CO₂ emissions from burning fossil fuels will rise to a record 36 billion metric tons (39.683 billion tons) this year.' Main contributors of CO₂ in to the atmosphere are usage of fossil fuel, transportation sector and power generation plants. Among all available technologies, which include; absorption via chemicals, membrane separation, cryogenic and adsorption are in practice around the globe. Adsorption of CO₂ using metal organic frameworks (MOF) is getting interest of researcher around the globe. In the current work, MOF-74 as well as modified MOF-74 with a sterically hindered amine (AMP) was synthesized and characterized. The modification was carried out using a sterically hindered amine in order to study the effect on its adsorption capacity. Resulting samples were characterized by using Fourier Transform Infrared Spectroscopy (FTIR), Field Emission Scanning Electron Microscope (FESEM), Thermal Gravimetric Analyser (TGA) and Brunauer-Emmett-Teller (BET). The FTIR results clearly confirmed the formation of MOF-74 structure and the presence of AMP. FESEM and TEM revealed the topography and morphology of the both MOF-74 and amine modified MOF. BET isotherm result shows that due to the addition of AMP in to the structure, significant enhancement of CO₂ adsorption was observed.

Keywords : adsorbents, amine, CO₂, global warming

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