Carbon dioxide capture by nanomaterials: A Review

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Abstract: The excessive emissions of carbon dioxide (CO_2) from various anthropogenic sources, such as combustion of fossil fuels in power plants, cement production which have severe impact on environment and some of its major effects like global warming are quite evident. The impact of global warming has gathered worldwide attention and the work on the development of effective and efficient methods to capture and store carbon dioxide has been predominantly done in past few years. Several techniques have been developed which are based either on the principles of adsorption, absorption or membrane separation but due to their efficiency and financial factors, more efficient and financially feasible techniques are being researched upon. In this respect, nanomaterials have shown promising results in capturing carbon dioxide or converting it into various other useful chemicals. Their large surface areas, porosity and the ability to form complex frameworks provide a large scope for the development of Carbon Capture and Storage (CCS) techniques. Polymers with sizable carbon dioxide adsorption have shown tremendous improvement in their carbon adsorption capacities upon grafting with carbon nanotubes. Similarly, design and fabrication of MOFs (Metal Organic Frameworks) have recently emerged as suitable methods for CCS. Such MOFs have been designed which contain pores that have just the right size to let carbon dioxide molecules in and the cavities inside the MOFs provide space to store the carbon dioxide. In this paper, we will be discussing the impact of nanomaterials on CCS techniques and their future prospectus as efficient and less hectic methods of CO_2 capture.

Keywords: Global warming, CCS, CO_2 capture, Nanotechnology, Nanotubes, MOFs

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