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Entitled

DESIGNING METAL-ORGANIC FRAMEWORKS FOR NATURAL GAS STORAGE AND DELIVERY

by

Labeeb Ali

Faculty Advisor

Dr Eyas Mahmoud, Department of Chemical and Petroleum Engineering

College of Engineering

Date & Venue

1:00 pm

Thursday, 25 June 2020

Online

Access link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_MzBmY2RhNmEtZGYzNC00ZGJjLWI2NzktNTc3YWZjODA0MTE5%40thread.v2/0?context=%7b%22Tid%22%3a%2223273350-d1e3-48b4-9415-3cd89a1f3857%22%2c%22Oid%22%3a%226fd9feee-ae53-4360-8657-fac13c8559ea%22%7d.

Abstract

Natural gas is considered as a major amongst all-natural resources within UAE, constitute about 90% methane, depending on the source, and as compared to other fossil fuels, it is more environmentally friendly. Being the second-largest energy source, energy demand from natural gas can be projected to exceed two hundred exajoules per year in 2040. In the United Arab Emirates, many natural gas filling stations are already built for utilizing natural gas as a vehicle transportation fuel where these materials have potential applications to store and deliver this fuel. This research aims to study various kinds of Metal-Organic frameworks and to investigate adsorption properties for the storage of natural gas and its delivery. The MOFs possess porous material that exhibits a high deliverable capacity of gases. MOFs are synthesized by using strategies such as crystal engineering with varying organic groups such as linker length and hydrophilicity, pore shape, and even phase changes. These design strategies are discussed in the way of mechanical properties, thermal management, and impurities effect on resulting processes as well as industrial manufacture and cost of MOFs. Synthesis and characterization of porous material (MOFs) are done by scanning electron microscope, thermogravimetric analysis, and X-rays diffraction analysis, respectively. Furthermore, the nitrogen adsorption technique was used to determine the porosity of these materials. Adsorption process, reaction heat, total heat evolved in the process, and other properties are studied by using a gas calorimeter. Designing and setting up of a calorimeter for testing the heat of adsorption of MOFs is a significant part of this research. In addition, the adsorption properties and separation of the gaseous mixture are also studied using the gas chromatography with some equipment modifications. Designing of MOFs, a class of adsorbents, is described considering the thermodynamics of adsorption of these porous materials for natural gas and methane storage. The thermodynamics of adsorption governs the adsorption isotherm and, therefore the deliverable capacity of stored natural gas and methane.

Keywords: metal-organic frameworks, methane storage, ANG; natural gas storage, synthesis, characterization, gas chromatography adsorption, adsorption calorimeter.