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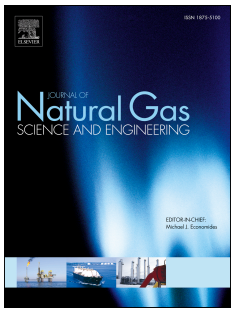

Preparation of MIL-101-nanoporous carbon as a new type of nanoadsorbent for H_2S removal from gas stream

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Preparation of MIL-101-nanoporous carbon as a new type of nanoadsorbent for H_2S removal from gas stream

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Abstract

In the present study, based on hydrothermal reaction, new hybrids containing metal organic frameworks MIL-101 (Cr) and nanoporous carbon (GCKP2) in different ratios from 10-50% were synthesized. The common methods such as Fourier transform infrared (FT-IR), thermogravimetric analysis (TGA), Field Emision Scanning Electron Microscopy (FE-SEM) and N_2 adsorption-desorption were used for characterization of these hybrids. The prepared materials were accordingly employed as adsorbent for H_2S removal process and the results showed adsorption of 10, 6.2, 7.9, 6.0 mmol/g at pressure around 9 bar for MIL-101, hybrids containing 10%, 30%, and 50% of nanoporous carbon, respectively. Furthermore, the adsorption equilibrium isotherms were used to describe the experimental data and the Langmuir-Frendlich equation appeared to provide a better fit for the H_2S adsorption by all synthesized hybrids. Relatively high H_2S adsorption capacity, easy and safe handling, and scalable use are some of the advantages of the present nanoadsorbents.

Keywords: H_2S adsorption, Hybrid, MIL-101(Cr), Equilibrium isotherms, Nanoporous carbon.

1. Introduction

Sulfur compounds emission has serious environmental and health effects. Hydrogen sulfide (H_2S) with a disgusting odor is well known as a highly volatile, toxic, and corrosive gas[1, 2]. In the atmosphere, sulfur dioxide (SO_2) resulted from oxidation of H_2S as a major source of acid rain can damage vegetation, agricultural products, the stonework of buildings, water resources, and living organisms[3]. Furthermore, H_2S in water is an important source of corrosion of pipes

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