MEDWIN PUBLISHERS
Committed to Create Value for Researchers

Petroleum & Petrochemical Engineering Journal
ISSN: 2578-4846

CO_2 Adsorption on Activated Carbon

Hedi J*

University of Pau and Pays de lAdour (UPPA), France

***Corresponding author:** Jedli Hedi, University of Pau and Pays de lAdour (UPPA), France, Tel: +3375 3637107; Email: jedli.hedi@gmail.com

Editorial

Volume 5 Issue 4

Received Date: December 09, 2021

Published Date: December 16, 2021

DOI: 10.23880/ppej-16000289

Editorial

Climate change is one of the major environmental, social and economic problems affecting the world. Carbon dioxide (CO_2) is considered to be the principal source of greenhouse gases that is responsible for global warming [1]. The IPCC believes that CO_2 concentration increases to 570 ppm by the year 2100, provoking a global average temperature to rise by about 1.9°C [2]. Various techniques have been used to reduce the CO_2 emissions among which the use of renewable energy, the energy control and the development of CO_2 capture and storage (CCS) technology [3]. The CCS technique has been considered as the best option for reducing carbon dioxide emissions from large point sources. The carbon dioxide (CO2) captured from large stationary sources can be safely injected and stored in appropriate geological formations, such as deep saline formations and depleted oil and gas reservoirs [4].

Adsorption process has become a potential attractive alternative for CO_2 storage in the context of carbon capture and sequestration technologies (CCS) because of its low energy requirements, cost effectiveness, and ease of use at a variety of pressures and temperatures [5]. Many different adsorbents can be used for this purpose such as clay, activated carbon (AC), zeolites, mesoporous silica, and organo-metallic structures [5].

Based on the above-mentioned studies, activated carbon (AC) is used as adsorbent with CO_2 [6]. The AC was characterized by SEM (Figure 1), wich present a roughness structure resembling a series of parallel lines. The AC gave rougher textures with heterogeneous surfaces and a greater variety of randomly distributed pores size. The N_2 isotherm (Figure 2) shows that the studied AC can be classified as a type I isotherm [6]. According to the IUPAC classification, the adsorbent is essentially formed by micropores with a very narrow microporosity. The textural parameters show that the AC has a significant porosity, with high values of total pore volume Vtotal (0.676 cm_3 g^{-1}), surface area S_{BET} (1565 m^2 g^{-1}) and micropore volume (0.649 cm^3 g^{-1}).

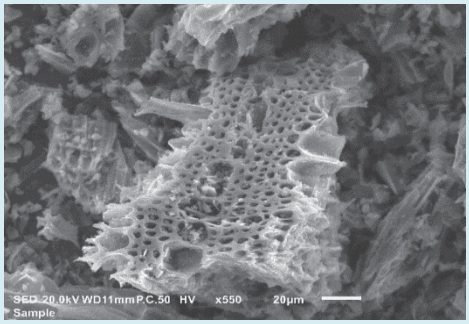

Figure 1: The AC was characterized by SEM.

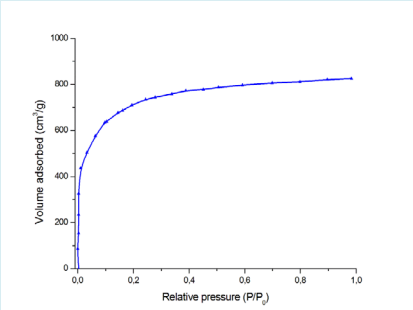

Figure 2: The N_2 isotherm.

The CO_2 adsorption isotherms in formulated AC were measured volumetrically at various temperatures (298, 310 and 320 K), and the experimental data were modeled with the Langmuir and Freundlich methods [6]. The Langmuir isotherm was employed to describe the monolayer

adsorption into the homogeneous surface. While the Freundlich isotherm was used for multilayer adsorption and surface heterogeneity (Figure 3). These parameters proved that the CO_2 adsorption is spontaneous, exothermic and physisorption in nature.

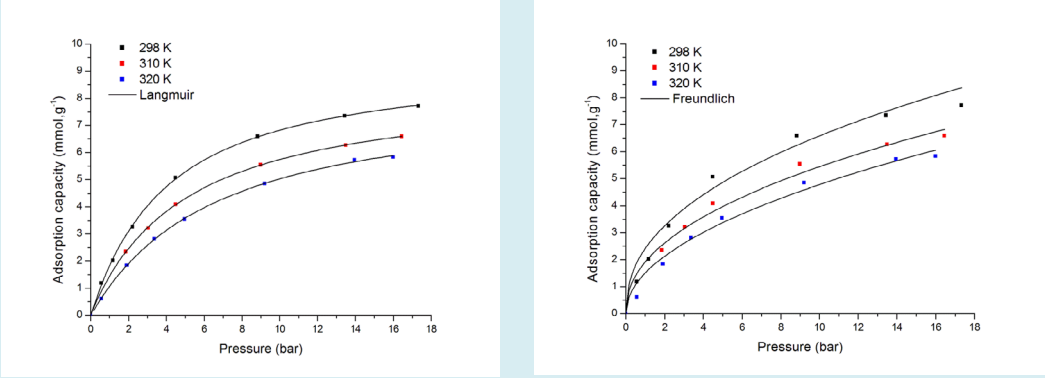

Figure 3: Results of Langmuir isotherm and Freundlich isotherm.

References

1. Wahby A, Silvestre-Albero J, Sepulveda-Escribano A, Rodrıguez-Reinoso F (2012) CO_2 adsorption on carbon molecular sieves. Microporous Mesoporous Mater 164: 280-287.

2. IEA, Energy technology perspectives.

3. Jedli H, Brahmi J, Hedfi H, Mbarek M, Bouzgarrou S, et al. (2018) Adsorption kinetics and thermodynamics properties of Supercritical CO_2 on activated clay. Journal of Petroleum Science and Engineering 166: 476-481.

4. Jedli H, Jbara A, Hedfi H, Bouzgarrou S, Slimi K (2017) A laboratory study of supercritical CO_2 adsorption on cap rocks in the geological storage conditions. Appl Phys A 123: 254.

5. Jedli H, Briki C, Chrouda A, Brahmi J, Abassi A, et al. (2019) Experimental and theoretical study of CO_2 adsorption by activated clay using statistical physics modeling. RSC Adv 9: 38454-38463.

6. Almoneef MM, Jedli H, Mbarek M (2021) Experimental study of CO_2 adsorption using activated carbon. Mater Res Express 8(6): 065602.