



41ª Reunión Ibérica de Adsorción

3^{er} Simposio Iberoamericano de Adsorción

5-7 septiembre/setembro/September 2018 · Gijón, Asturias (España)

ABSTRACTS BOOK



**41ª Reunión Ibérica de Adsorción - 3^{er} Simposio
Iberoamericano de Adsorción**

**41ª Reunião Ibérica de Adsorção - 3º Simpósio Ibero-
Americano de Adsorção**

41st Iberian Adsorption Meeting - 3rd Iberoamerican
Adsorption Symposium

Palacio de Congresos de Gijón, Sala Anfiteatro
Recinto Ferial Luis Adaro, Gijón
5-7 Septiembre/**Setembro**/September 2018

Organized by:



Universidad de Oviedo
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Local bus www.busgijon.es

Taxi <http://www.radiotaxigijon.com/web/>

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VENUE

Conference. Gijón Convention Center. Av. Dr. Fleming, 481, Gijón

Adsorption School.

Tuesday. Casino de Asturias, Sala Acapulco, Fernández Vallín St., 5, 33205, Gijón

Wednesday-Friday. Gijón Convention Center. Av. Dr. Fleming, 481, Gijón

Iberoamerican Women Scientists Round Table (OPEN ACTIVITY). Antigua Escuela de Comercio, Francisco Tomás y Valiente St., 33201 Gijón

Opening Ceremony and Welcome Cocktail. Casino de Asturias, Sala Acapulco. Fernández Vallín St., 5, 33205, Gijón.

Adsorption at the pub (OPEN ACTIVITY). Savoy, Covadonga St, 5, 33202 Gijón

Gala Dinner. Bellavista Restaurant, Av. José García Bernardo, 256, 33203, Gijón



Equilibrium Adsorption of CO₂, CH₄ and N₂ on BETA Zeolites at Post-Combustion Operational Conditions

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Recently, natural gas has provided one-fourth of the energy supplies of the world, and it is expected to be exceeded more than 50% over the next 20 years [1]. Also, biogas and other digester gases have been considered as attractive alternatives for natural gas because of their high methane content. In the other hand, one of the main drawbacks of these energy sources is their impurities including carbon dioxide and nitrogen [2]. In the recent years, several adsorbents have been introduced for purification and upgrading natural gas and biogas [3, 4]. Thus in this study, adsorption equilibrium of CO₂, CH₄ and N₂ in three different types of BETA zeolites including, H-BETA-25, Na-BETA-25 and H-BETA-150 have been investigated at three temperatures (313, 373 and 423 K) and partial pressure range between 0.33 and 4.16 bar. The experimental data have been obtained in a fixed bed reactor using breakthrough technique. The results showed CO₂ has the highest adsorption ability to adsorb while N₂ has the lowest uptake amount in all adsorbents. Also, it was specified that Na-BETA-25 has a significant higher capacity than H-BETA-25 and H-BETA-150 to the adsorption in all operational conditions. Regarding the selectivity of gases, H-BETA-150 which has the lowest adsorption capacity shows the best results with decreasing value in pair order CO₂/N₂ > CO₂/CH₄ > CH₄/N₂ (6.65, 3.24 and 2.05 at 313 K, respectively). The selectivity order is the same for all three zeolites at the mentioned temperatures. In addition, Langmuir isotherm was applied to model the experimental values. Adsorption equilibrium isotherms of CO₂, CH₄ and N₂ on pellets of H-BETA-25 zeolite have been depicted in Fig. 1. As can be observed there is a good agreement between experimental data and isotherm model.

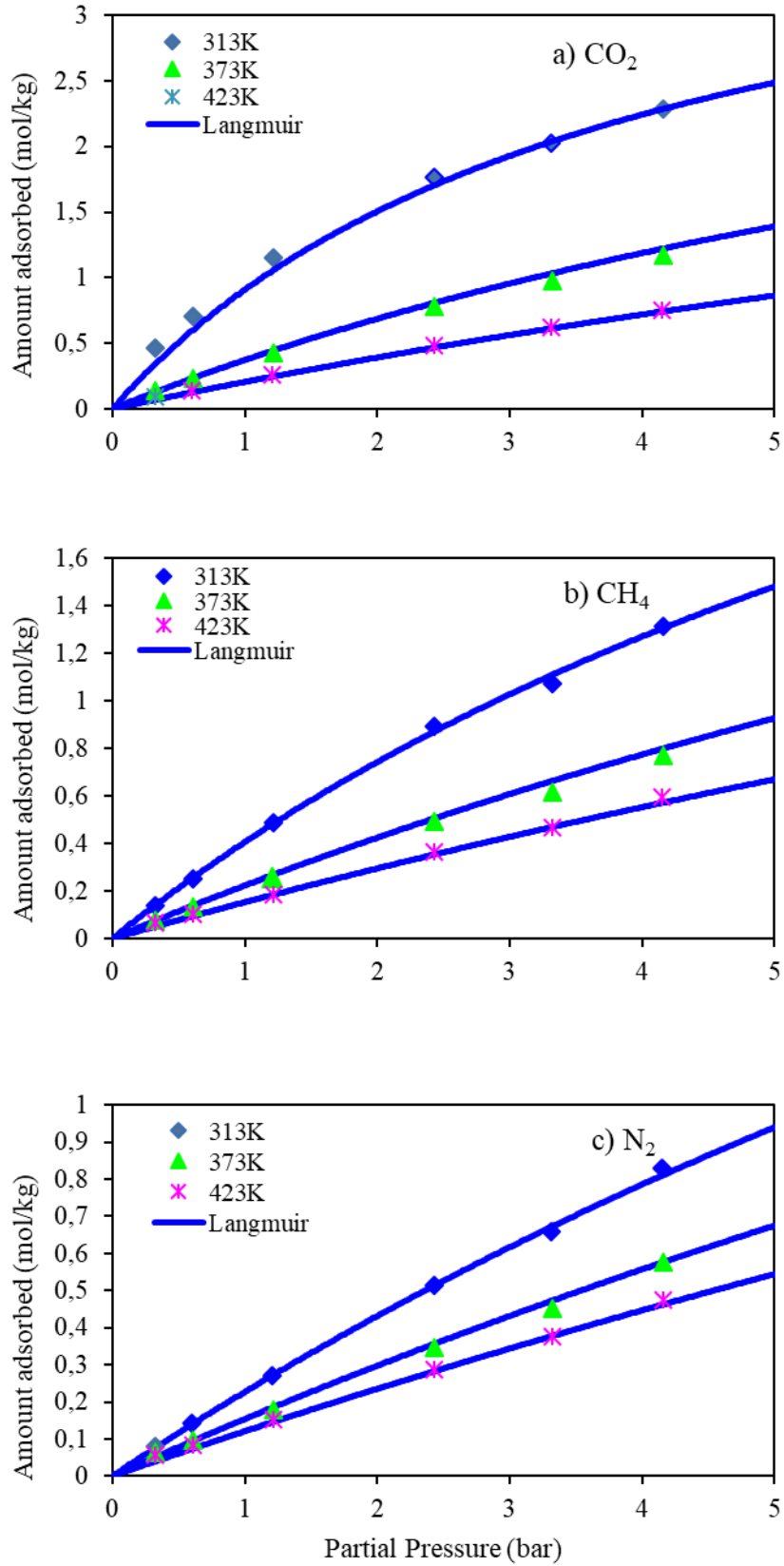


Figure 1: Experimental equilibrium (symbols) data and fitted Langmuir isotherm (lines) for (a) CO₂, (b) CH₄ and (c) N₂ adsorption at 313 K, 373 K and 423 K with H-BETA-25 zeolite.

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References:

- [1]. Yi H, Li F, Ning P, Tang X, Peng J, Li Y, Deng H, *Chemical Engineering Journal*, 215, 635-642 (2013).
- [2]. Pires J, Saini V K, Pinto M L, *Environmental Science & Technology*, 42, 8727–8732 (2009).
- [3]. Silva J A C, Schumann K, Rodrigues A E, *Microporous and Mesoporous Materials*, 158, 219–228 (2012).
- [4]. Bastin, L, Barcia P S, Hurtado E J, Silva J A C, Rodrigues A E, Chen B A, *The Journal of Physical Chemistry C*, 112, 1575-1581 (2008).