

## Accepted Manuscript

Title: Testing the Stability of Novel Adsorbents for Carbon Capture Applications using the Zero Length Column Technique

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PII: S0263-8762(18)30025-X  
DOI: <https://doi.org/doi:10.1016/j.cherd.2018.01.023>  
Reference: CHERD 2997

To appear in:

Received date: 31-7-2017  
Revised date: 7-1-2018  
Accepted date: 9-1-2018

Please cite this article as: Hu, X., Brandani, S., Benin, A.I., Willis, R.R., Testing the Stability of Novel Adsorbents for Carbon Capture Applications using the Zero Length Column Technique, *Chemical Engineering Research and Design* (2018), <https://doi.org/10.1016/j.cherd.2018.01.023>

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# Testing the Stability of Novel Adsorbents for Carbon Capture

## Applications using the Zero Length Column Technique

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### ABSTRACT

In this paper, a semi-automated ZLC technique was used to study the stability of novel adsorbents in the presence of water, SO<sub>x</sub> and NO<sub>x</sub> impurities present in coal-fired power plant flue gas. The tests were carried out at 38°C and 0.1 bar pressure on the most promising materials of the M/DOBDC ((M = Co, Ni, Mg)) MOF series, as well as on commercial 13X zeolite pellets. The experimental results indicated that even if the DOBDC family shows high CO<sub>2</sub> adsorption capacity at low partial pressure at ambient conditions, impurities have a strong effect on their stability. The ZLC system provides quantitative information on the deactivation of samples due to SO<sub>x</sub> and NO<sub>x</sub> in a relatively short time and using less than 15 mg of sample. The fact that the treatment can be repeated *in situ* in the apparatus used also for measuring the CO<sub>2</sub> capacity of the sample has shown that the ZLC can be a valuable tool in screening novel adsorbents for carbon capture applications.

Keywords: Zero length column (ZLC), adsorption, MOFs, CO<sub>2</sub> capture, stability, flue gas, SO<sub>x</sub>, NO<sub>x</sub>.

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