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Masoud Jahandar Lashaki, Abdelhamid Sayari

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# $CO_2$ Capture Using Triamine-Grafted SBA-15: The Impact of the Support Pore Structure

Masoud Jahandar Lashaki and Abdelhamid Sayari*

Centre for Catalysis Research and Innovation, Department of Chemistry and Biomolecular Sciences, University of Ottawa, Ottawa, Ontario, Canada K1N 6N5

## Abstract

The impact of the support pore structure on the $CO_2$ adsorption performance of triamine-tethered SBA-15 silica was studied. Six SBA-15 silica supports with different pore sizes and intrawall pore volumes were synthesized, followed by triamine functionalization through dry and wet grafting (i.e., with and without added water). $CO_2$ adsorption measurements showed the positive impact of support large pore size and high intrawall pore volume on adsorptive properties, with the former being dominant. Large-pore supports exhibited the highest surface density of amine groups (up to 35 μmol/$m^2$), highest $CO_2$ uptakes (up to 1.88 mmol $CO_2$ /g) and $CO_2$/N ratios (up to 0.33 mol $CO_2$/mol N), and fastest adsorption kinetics. When the intrawall pore volume decreased by 53% for samples with identical pore sizes, lower $CO_2$ uptakes (up to 63%) and $CO_2$/N ratios (up to 62%), and slower adsorption kinetics were observed, particularly for the lowest adsorption temperature (i.e., 25 $^oC$). It was inferred that large pore size and/or high intrawall pore volume of the support improve the adsorptive properties via enhanced amine accessibility. Large-pore supports also allowed higher surface amine density to be achieved because of reduced steric hindrance between grafted triamine species.

* Corresponding Author. Email: abdel.sayari@uottawa.ca; Tel: 613-562-5483 (A. Sayari)