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Introduction

The increase of global CO_2 concentration is the main responsible for global warming. Nitrogen containing ordered mesoporous carbons (NOMCs) are here proposed as CO_2 adsorbents, thanks to their adsorption ability and selectivity in simulated flue gases mixtures. In this work, NOMCs are synthesized as replications of an ordered mesoporous silica hard template, using the well-known nanocasting route. This method is convenient for achieving a pore architecture composed of both micro- and mesopores able to promote at the same time improved capture performances and fast kinetics of gas diffusion, respectively. One of the drawbacks of the synthesis of NOMCs is the use of toxic carbon/nitrogen sources or the addition of post-synthesis treatments for the nitrogen doping process.

Material and methods

A more sustainable approach is proposed in this work, using eco-friendly sources as nitrogen-rich carbon precursors. The effect of the pyrolysis temperature (varied from 600 to 900°C) on the development of microporosity and N incorporation was related to pure CO_2 adsorption and selectivity in CO_2/N_2 mixtures (20/80 v/v).

Results and discussion

A maximum CO_2 adsorption capacity of 1.47 mmol g^{-1} was achieved by the sample pyrolized at the highest temperature (i.e., 900°C) at 30°C / 0.9 bar / pure CO_2, while a CO_2 uptake of 0.82 mmol g^{-1} was obtained by the sample pyrolized at the lowest temperature (i.e., 600°C) at 35°C / 1 bar / 20% CO_2. The enhancement in pure CO_2 adsorption is due to the increase of the micropore content. On the contrary, a lower pyrolysis temperature (600°C) allowed for the retention of a higher amount of N, beneficial for the selective adsorption of CO_2 in presence of N_2.