

Synthesis of selective small pore nanozeolites for CO₂ adsorption

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Date de la soutenance

16/12/2024 à 10:30

Lieu de la soutenance

Université de Caen (LCS, ENSICAEN), Bâtiment A, Amphithéâtre 1

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Abstract

The main objective of this PhD thesis is the development of small-pore nanosized zeolites targeting a high adsorption selectivity towards CO₂. The first two chapters present the current state of the art on various features and properties of zeolites, their synthesis routes, and applications. The syntheses procedures carried out in this work and the characterisation techniques used are presented. The third chapter describes the low partial pressure adsorption behaviour of CO₂ in the porous network of nanometric Chabazite (CHA) synthesised in the presence of calcium and barium cations used as structure-directing agents. The fourth chapter details the crystallisation of pure phases and intergrown chabazite (CHA)/Phillipsite (PHI) zeolite samples. The performance of the obtained zeolites is evaluated in adsorption of carbon dioxide and nitrogen. Finally, the fifth chapter presents the development of an autonomous synthesis procedure for nanosized zeolites and details the steps involved in optimising its operating conditions. This synthesis carried out by robot stands at the interface between largescale synthesis and screening experimentation, providing the means to easily reproduce challenging syntheses.