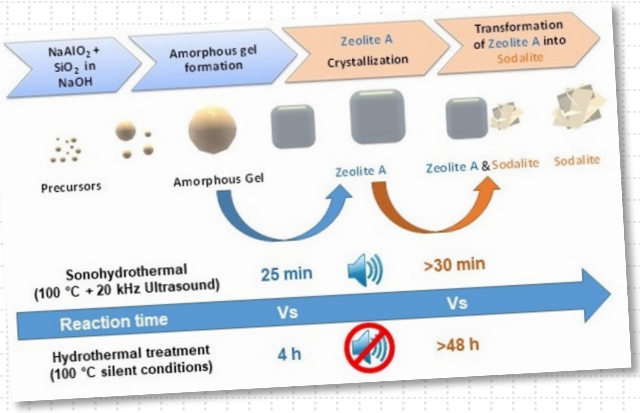
PhD DEFENSE

Combining ultrasound and hydrothermal conditions as an innovative approach to synthesizing microporous materials:

Study and understanding of the crystallization process of LTA zeolite



David-william's NZODOM DJOZING

Sonochemistry in Complex Fluids (LSFC)

Wednesday, October 22, 2025

10:00 AM

Auditorium ICSM

This thesis explored the sonohydrothermal synthesis of zeolites as an innovative approach for designing microporous materials, with particular focus on LTA-type zeolite and its phase transition toward sodalite. The study investigated the influence of ultrasound on crystallization mechanisms, morphology, and product stability, highlighting its role in accelerating nucleation, controlling morphology, directing phase transitions, and stabilizing the resulting structures. It also revealed the impact of ultrasonic irradiation on cation exchange mechanisms and the adsorption capacity of LTA. Characterization using various analytical techniques (XRD, SEM-EDS, TEM, BET, NMR) provided insights into the structuring mechanisms of LTA and demonstrated the benefits of coupling ultrasound with hydrothermal conditions, achieving synthesis rates up to 9.6 times faster than under static hydrothermal conditions and 2.4 times faster than with mechanical stirring. These findings emphasize the potential of this approach not only to optimize the synthesis of porous materials, but also to extend it to other systems such as perovskite-type mixed oxides, microporous metallosilicates, or even the direct synthesis of hybrid materials incorporating an active phase, particularly for catalytic applications.

Keywords: Sonochemistry; LTA zeolite; SHT, cation-exchange

WE LOOK FORWARD TO SEEING MANY OF YOU!