

Multidiagnostic Analysis to Track Zeolite Formation

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Introduction

The formation of zeolites in presence of tetraalkylammonium cations from so-called clear solutions using silicon alkoxides is a highly complex process. Our research aims to identify the key mechanisms on a molecular scale with the goal of understanding the factors that drive the formation of zeolites [1]. For this purpose we have used electrospray ionization mass spectrometry (ESI-MS), ²⁹Si and ²⁷Al liquid-NMR spectrometry, DOSY NMR (diffusion experiments) and small angle X-ray scattering (SAXS).

Results and Discussion

Here, we report the molecular mechanisms involved in the formation of microporous zeolite beta from liquid phase (Fig.1). The connectivity of both, oligomers and nanoparticles (NPs), has been quantitatively analysed, as well as the incorporation of Al in NPs and the specific interaction of silica-template within NPs. These data are compared with previous results on zeolites ZSM-5 (MFI), ZSM-11 (MEL) and SSZ-13 (CHA) from which general processes are concluded independently of the zeolite and/or template investigated [2].

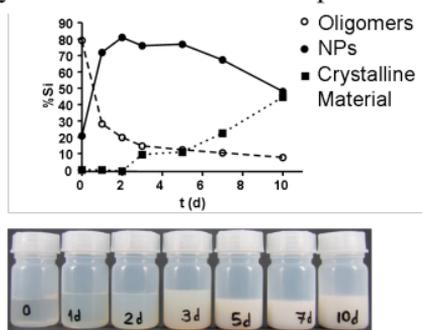


Figure1. Zeolite beta crystallization from clear solution monitored by ²⁹Si NMR.

[1] Castro *et al* (2013) *Micropor. Mesopor. Mat.* (in press). [2] Eilersten *et al* (2012) *Chem. Mater.* **24**, 571-578