Synthesis of nanosized zeolites for VOCs detection

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Abstract. Detection of volatile organic compounds (VOCs) is essential in many areas such as environmental monitoring, industrial safety and healthcare [1]. Zeolites have recently emerged as promising microporous materials for gas sensing due to their unique properties including different pore sizes, shapes, large surface area, high adsorption capacity, excellent selectivity, and hydrophilic/hydrophobic characteristics [2]. Our previous work has successfully demonstrated the deposition of zeolites onto sensor devices, followed by testing their reactivity on ethanol adsorption [3].

In that context, this work aims at using MFI zeolites structure for VOC detection, addressing challenges of selectivity and sensitivity in real-world conditions. Two different MFI-type nanozeolites, one as pure silica and the other Mo-containing with different particle sizes were synthesized and subjected to further characterizations.

In order to develop a better understanding of their physico-chemical properties and evaluate their behaviour towards acetone detection, the zeolite samples were characterized thoroughly by XRD, SEM, FTIR and *in situ* IR spectroscopy. The zeolites with particle sizes of 100, 200 and 2000 nm are shown in Fig. 1a-c. *In situ* IR revealed that Mo-containing MFI zeolites exhibit lower silanol (-Si-OH) content compared to pure silica MFI, leading to high physisorption capacity for acetone (Fig. 1d-f). Furthermore, acetone was

found to interact more strongly with the silanols of the pure silica zeolite (Si-MFI) than with those on Mo-containing MFI under the same conditions. These findings confirm the potential of MFI type nanozeolites for detection of VOCs.

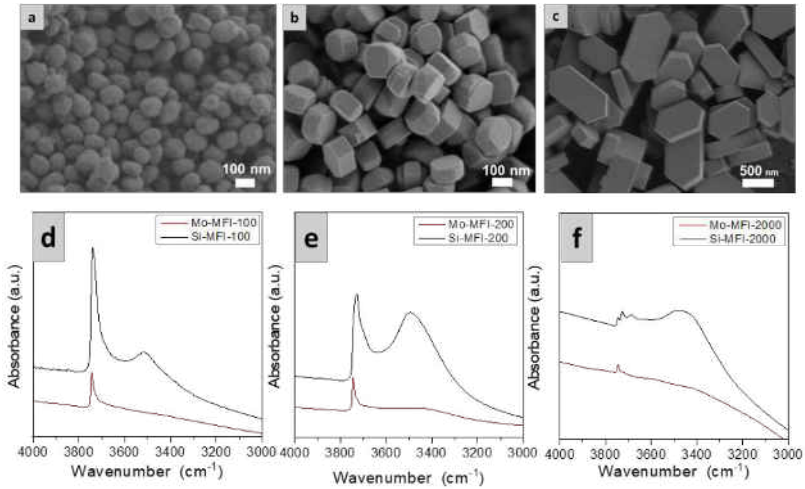

Fig 1. (a-c) SEM images of pure silica MFI zeolites: (a) Si-MFI-100, (b) Si-MFI-200, (c) Si-MFI-2000, (d-f) Corresponding FTIR Spectra of silanol groups.

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