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Morphology Controlled Lifetime and Selectivity in Zeolite Catalysis

S. Teketel¹, L. Lundegaard², W. Skistad¹, U. Olsbye¹, K. Lillerud¹, P. Beato², S. Svelle¹

¹*inGAP Centre of Research-based Innovation, University of Oslo, Oslo, Norway,* ²*Haldor Topsøe A/S, Lyngby, Denmark*

Zeolites are widely used in the chemical industry for their catalytic properties and their ability to control the size and shape of both reactant and product molecules. In this presentation we will show unexpected catalytic properties of ZSM-57 and SUZ-4 during conversion of methanol to hydrocarbons (MTH). We have previously shown how analysis of anisotropic peak broadening in XRPD data [1] can reveal not only the average shape of the crystallites, but also how the zeolite channels are orientated relative to the morphology [2]. The same method was used to analyze the ZSM-57 and SUZ-4 samples revealing nano-sheet and -needle morphologies respectively. Electron imaging and diffraction furthermore revealed that the sheets of ZSM-57 are five-fold twinned with the 10-ring channel system perpendicular to the sheet. The 8-ring channel system would form a closed pentagon shape in defect free crystals. Based on these observations we will explain the remarkable MTH lifetime and selectivity displayed by the ZSM-57 and SUZ-4 samples respectively [3].

[1] A. Katerinopoulou, T. Balic-Zunic, L. F. Lundegaard "Application of the Ellipsoid Modeling of the Average Shape of Nanosized Crystallites in Powder Diffraction" *Journal of Applied Crystallography* 45:22-27 (2012)., [2] B. T. L. Bleken, D. S. Wragg, B. Arstad, A. E. Gunnæs, J. Mouzon, S. Helveg, L. F. Lundegaard, P. Beato, S. Bordiga, U. Olsbye, S. Svelle, K. P. Lillerud "Unit Cell Thick Nanosheets of Zeolite H-ZSM-5: Structure and Activity" *Topics in Catalysis* 56: 558–, [3] S. Teketel, L. F. Lundegaard, W. Skistad, U. Olsbye, K. P. Lillerud, P. Beato, S. Svelle (submitted)

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