

## Experiment Report Form



<b>Experiment title:</b> Monitoring the formation, accumulation and deactivation of hydrocarbon pool species in zeolites using time- and space-resolved X-Ray Diffraction	<b>Experiment number:</b> 01-02-1049	
<b>Beamline:</b> BM-01A	<b>Date of experiment:</b> from: 2014-06-30      to: 2014-07-05	<b>Date of report:</b> 18-02-2016  <i>Received at ESRF:</i>
<b>Shifts:</b> 15	<b>Local contact(s):</b> Vadim Diadkin	
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### Report:

The data obtained have been published in:

Del Campo, Pablo; Slawinski, Wojciech Andrzej; Henry, Reynald Philippe; Westgård Erichsen, Marius; Svelle, Stian; Beato, Pablo; Wragg, David & Olsbye, Unni (2015). "Time- and space-resolved high energy operando X-ray diffraction for monitoring the methanol to hydrocarbons reaction over H-ZSM-22 zeolite catalyst in different conditions". **Surface Science**. ISSN 0039-6028. . doi: 10.1016/j.susc.2015.10.049

### Abstract

The conversion of methanol to hydrocarbons (MTH) over H-ZSM-22 was studied by operando time- and space-resolved X-ray diffraction (XRD) at 370–385 °C and WHSV = 2 g/g h at the Swiss–Norwegian Beamline at ESRF. The performance of a commercial H-ZSM-22 sample was compared before and after acid–base treatment, and with and without propanol co-feed, respectively.

N<sub>2</sub> adsorption, Scanning Electron Microscopy and propyl amine desorption experiments showed that acid–base treatment led to enhanced accessibility of acid sites, mainly due to the formation of mesopores between agglomerated H-ZSM-22 crystals.

The catalytic set-up allowed us to simultaneously observe the catalyst activity and unit cell volume variations by time- and space-resolved HXRD in operando conditions. The expansion of the unit cell and final flattening at different positions in the catalytic bed matched very nicely with the catalytic activity gradients. Different scenarios provided different behaviors and gave insights in the effect of morphology and co-feed process on the activity in the MTH process. This technique is the only one which has so far been able to provide direct evidence of the behavior of the species inside the catalytic reactor.