

## Master project

PSI, Bioenergy and Catalysis Laboratory, Villigen PSI

### Hydrothermal aging procedure of SCR catalysts under constant flow

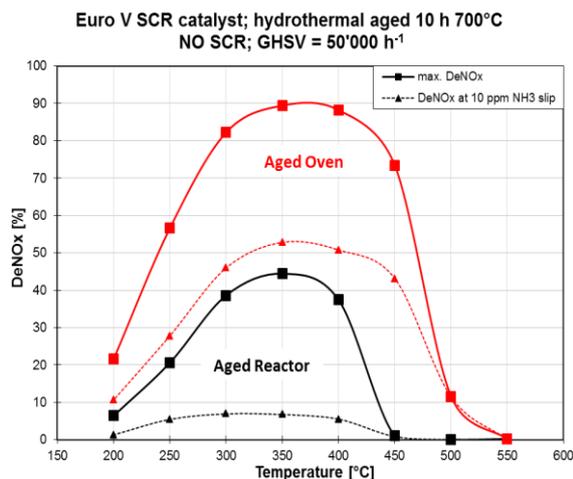
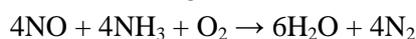


Fig. 1: DeNO<sub>x</sub> of a standard V-SCR cat.

The selective catalytic reduction (SCR) of NO<sub>x</sub> by NH<sub>3</sub> is up to date the most efficient post treatment method for reducing nitrogen oxides emissions. Toxic NO<sub>x</sub> are reacting with injected ammonia to form nitrogen and water according to the reaction:



A typical SCR catalyst consists of a support material such as TiO<sub>2</sub>, promoters like WO<sub>3</sub> and SiO<sub>2</sub> as well as the active species based on V<sub>2</sub>O<sub>5</sub>. These catalysts, used in stationary as well as mobile sources, normally exhibit a lifetime up to 5 years. In order to mimic a long term use of working catalysts, laboratory aging procedures have to be developed.

Since temperature is one parameter that affects the catalyst lifetime, often a high calcination temperature is chosen for its aging. To that end, also moisture (exhaust gas normally consists of around 10% H<sub>2</sub>O) is affecting the performance and durability. Preliminary tests in our lab have shown that the aging is even more severe when a catalyst is hydrothermally aged under a constant flow (Figure 1).

The aim of the project is to investigate different aging procedures of standard and novel V-based catalysts. The influence of H<sub>2</sub>O as well as the aging under a constant flow will be tested on monolith and powder SCR catalysts. Additional information will be obtained from BET, XRD, XRF and DRIFTS in order to find correlations between structural properties and the catalytic activity as a function of the aging protocol.

#### Tasks

- Implementing an aging procedure for hydrothermal aging
- Characterization using XRD, XRF, BET and infrared spectroscopy
- Catalytic activity measurement of powder and washcoated catalysts

#### Benefits

- Training in the use of catalytic reactor set up and standard characterization techniques
- Learning to write scientific reports and to present results on conferences/workshops
- Work in the international team

**Type of work:** Master

**Application:** automotive catalysis

**Nature of work:** experimental

**Requirements:** interests in chemistry, materials science, lab-work, characterization methods, catalysis

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