Kinetic Modeling and DeNOx Characteristics for Integrated Urea DPF/SCR System

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Introduction
Integrated DPF and SCR technology, which can simultaneously reduce NOx and soot, provides cost reduction and packaging flexibility. This ongoing technology is also called SCR Filter and brings both opportunities and challenges.

Objective
- SCR kinetic modeling
- Clean SCR Filter deNOx performance
- Loaded SCR Filter deNOx performance

Schematics of DPF, conventional flow through type SCR and SCR Filter

Clean SCR Filter deNOx

<table>
<thead>
<tr>
<th>NH3/NOx (ANR)</th>
<th>Temperature (°C)</th>
<th>NOx Conversion (%)</th>
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</thead>
<tbody>
<tr>
<td>ANR=1.0</td>
<td>200, 300, 400, 500</td>
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<tr>
<td>ANR=1.2</td>
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Feed Gas Composition
- NOx (ppm)
- NO/NO2
- NH3/NOx
- O2 (%)
- H2O (%)
- CO2 (%)
- N2/Balance

Space Velocity (SV) 30K, 75K, 120K

Loaded SCR Filter deNOx

- NOx/NO2 ratio has similar influence on both clean and soot loaded filter.
- SV doesn’t influence deNOx performance too much in current study, but has large influence on concentration distribution.
- High ANR leads to high NOx conversion and high NH3 slip.
- Wall soot is responsible for the NOx conversion decrease.
- Effect of soot inside cake layer on NOx conversion is very small compared to wall soot.

Future Work
- Control strategies for ammonia injection
- Effect of active soot regeneration on deNOx performance
- System level simulation