HTE FOR ENVIRONMENTAL CATALYSIS

THE HIGH THROUGHPUT EXPERIMENTATION COMPANY

FOR CLEANER AIR

NEW MATERIALS FOR EFFICIENT CATALYTIC CONVERTERS

hte provides high throughput catalyst development services in various fields of automotive and stationary exhaust aftertreatment. This is made possible by automated catalyst synthesis capabilities, proprietary parallel catalyst testing systems, and deep application expertise. The following data sheet shows reliable data obtained for catalysts in DeNOx applications by applying relevant test protocols and how this can accelerate the development of advanced catalyst solutions for automotive exhaust emission control.

SOLUTIONS

- High throughput catalyst synthesis and aging
- Parallel testing in 48-fold units using small quantities of powders
- Fully automated and computer-controlled 24/7 operation with hte's software solution hteControl™
- Additional core test unit for monolith samples (scale-up)
- Cold start test unit for dynamic test protocols (temperature ramps)
- Online analytics (incl. FTIR, MS analyzers)
- Integration into hte's software solution myhte™ for data acquisition, processing, and reporting
- Fully integrated workflow for R&D projects

BENEFITS

- Combination of high throughput testing with statistical tools like DoE allows screening of large parameter spaces
- Simplified experiments save time and costs compared to engine bench or vehicle testing
- Scientific consulting and data interpretation

TYPICAL R&D USE CASES

- Primary screening of new materials
- Optimization of washcoat/catalyst composition
- Accelerated testing under realistic conditions

VARIOUS AUTOMOTIVE AND STATIONARY APPLICATIONS:

EASY CHANGE OF OPERATION MODES, CROSS-VALIDATED TEST PROTOCOLS

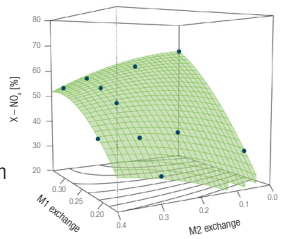
DOC
SCR
LNT
TWC
PNA

STATIONARY DeNOx
CH_4 OXIDATION
N_2O ABATEMENT

AND OTHERS

CASE STUDY – SCREENING OF DENOX CATALYSTS (SCR)

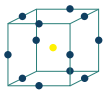
4. Modeling: Interface to software modeling myhte™



Dopant impact on activity at 200°C

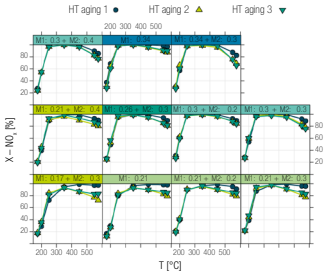
1. Experiment Planning

Box-Behnken



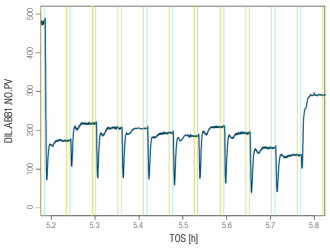
Simplex lattice

3. Reduced Data: Link to sample, data archive myhte™



NOx conversion vs temperature subject to composition and ageing

2. Raw Data: Automated data collection and aggregation with hteControl™



Output of NO analyser vs. time

OVERVIEW TEST PROTOCOLS

AVERAGE THROUGHPUT (IN SAMPLES/WEEK) FOR DIFFERENT TEST PROTOCOLS

Topic	Performance characteristics/Protocols	Typical throughput (samples/week)	Data output (data points/week)
DOC	Light-off performance (CO/HC/NO) and sulfur resistance 2-5 light-off runs per sample	45 - 135	4,500 - 11,250
SCR	Low and high temperature SCR performance 4 protocols (standard and fast SCR, ammonia oxidation, and storage)	30-45 45-135 (w/o NH_3 storage)	2,800 - 4,200
TWC	Oxygen storage capacity (OSC) Catalytic performance: light-off, λ-sweep for CO/HC/NO	225 45-90 (L/O and λ-sweep)	900 6,000 - 12,000 (L/O and λ-sweep)
LNT	NO_x efficiencies (lean/rich and lean) and NO_x storage (lean) at 3 temperatures, 5 cycles per position, 2 sample loads	45	1,800 - 2,700

TESTING TECHNOLOGY

TYPICAL 48-FOLD PARALLEL REACTOR SYSTEMS

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