

## Background

The TOPSØE CATALYSIS FORUM was created as a framework for an open exchange of views on catalysis in the fields of interest to Haldor Topsøe. The forum is conceived as a platform for discussions of new reactions, processes and principles of catalysis in an attempt to jointly look beyond the horizon. In order to facilitate an open debate and to enable all participants to make use of the information received during the meetings in their future work, the forum is held on a non-confidential basis. The TOPSØE CATALYSIS FORUM works through individual contacts and annual meetings focusing on a single topic.

The topic of the 6th TOPSØE CATALYSIS FORUM is:

### Catalysis in new environmental processes

Growing concerns about human health, climate, nature diversity and available resources of the planet have been major drivers for the development and implementation of environmental technologies in industry over the last 50 years. Catalysis will remain essential in this continuing quest for better resource utilisation and reduced environmental impact of industrial processing and modern lifestyle. Environmental catalysis provides a wide range of solutions to these future challenges in terms of alternative processing routes without secondary pollutant formation, increased efficiency and catalytic waste gas cleaning. The latter is typically one of the final process steps before emission to a stack or an exhaust pipe of a car where the large gas volumes at almost ambient pressure calls for monoliths or other structured catalyst designs achieving low pressure drop or high dust tolerance. In the power sector, removal of fly ash,  $\text{SO}_2$  and  $\text{NO}_x$  has been implemented in most parts of the world for coal-fired plants. However, new challenges have also emerged such as combustion of waste, biomass and heavy oil residues, oxyfuel combustion and removal of Hg and dioxins. Improved catalysts and technologies must also be developed for Claus and sulphuric acid plants to meet the gradually increasing demands for lower emissions of  $\text{SO}_2$ . While 3-way catalysts have been applied for gasoline-driven cars for more than a decade, a considerable effort is currently devoted to the development of catalytic systems for diesel-driven mobile sources e.g. trucks, buses, cars, trains and ships for which future legislation will require catalytic removal of  $\text{NO}_x$ , soot and volatile organic compounds (VOC). New demands for better fuel efficiency will call for alternative catalytic systems for gasoline cars operating at lean burn conditions. Improved energy-efficiency of industrial processing by means of catalysis reduces  $\text{CO}_2$  emissions and slows down the depletion of the global reserves of fossil fuels. On the long term, however, more radical solutions must be found to reduce greenhouse gas emissions along with the development of alternative energy sources.

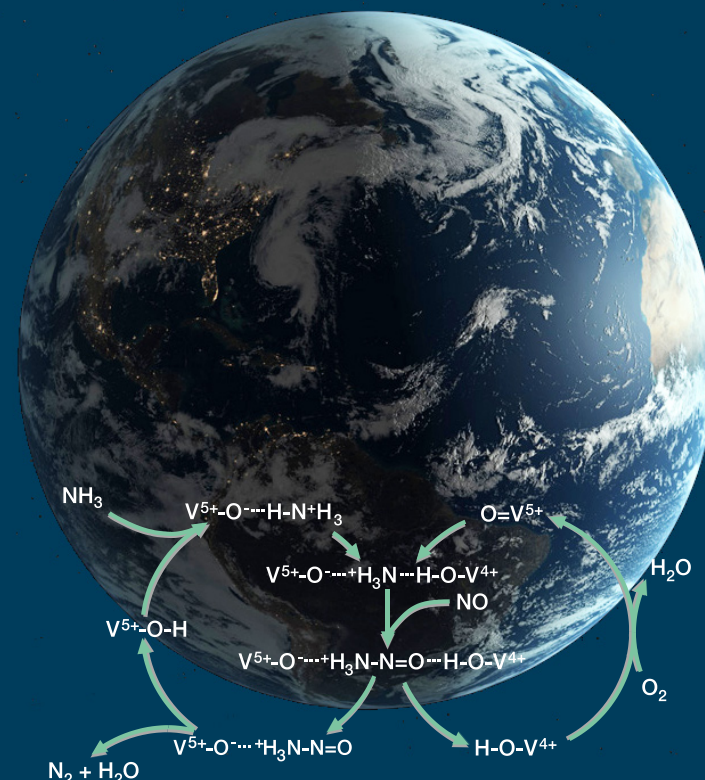
The aim of this seminar is to discuss current and future practices of environmental catalysis. It should be done with an open mind in order not just to review current knowledge but also to provide a basis for new innovations within the area.

#### Scientific committee

Jesper Nerlov (jen@topsoe.dk)  
Glen Starch-Hytoft (gh@topsoe.dk)  
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Henrik Topsøe (het@topsoe.dk)

#### Organising committee

Kurt Christensen (kc@topsoe.dk)  
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## Topsøe Catalysis Forum

### Catalysis in new environmental processes

Munkerupgaard 27-28 August 2009

RESEARCH | TECHNOLOGY | CATALYSTS

## Programme

The TOPSØE CATALYSIS FORUM is organised as a two-day topical meeting. The first day is devoted to overview lectures which set the scene and form the basis for the discussions. On the second day, the discussions and exchange of views will take place in three groups, each organised around a specific sub-topic.

Participation is by invitation only. Besides the presenters, representatives from industrial collaboration partners are invited, but the majority of the participants is Haldor Topsøe staff. On the first day of the meeting, up to 75 participants will be present whereas about 50 will take part in the discussions on the second day. The meeting is held on a non-confidential basis.

### Wednesday, 26 August

12:00-15:30 Visit to the Haldor Topsøe Headquarters

19:00 Buffet at Munkeupgaard

### Thursday, 27 August

07:30-09:00 Breakfast and arrival of local participants

09:00-09:10 Welcome address, Jesper Nerlov, Haldor Topsøe

#### Plenary morning session - chairman: Kim G. Knudsen, Haldor Topsøe

09:10-10:00 **Structured catalysts in environmental catalysis**  
Enrico Tronconi, Politecnico di Milano

10:00-10:50 **Catalytic decomposition of nitrous oxide (N<sub>2</sub>O)**  
Javier Pérez-Ramírez, Institute of Chemical Research of Catalonia

Coffee break

11:10-12:00 **Future perspectives of photocatalysis for energy production**  
Jens Nørskov, Technical University of Denmark

Lunch

#### Plenary afternoon session – chairman: Glen Starch-Hytoft, Haldor Topsøe

13:30-14:20 **Electrochemical decomposition of NO<sub>x</sub>**  
Koichi Hamamoto, Advanced Industrial Science and Technology (AIST)

14:20-15:10 **Future emission control strategies for marine vessels**  
Niels Kjemtrup, MAN Diesel

Coffee break

15:30-16:20 **Carbon capture and storage (CCS) in power production**  
Willy van Well, Dong Energy A/S

19:00 Conference dinner

### Friday, 28 August

07:30-08:45 Breakfast

08:45-09:00 Introduction to group discussions, Claus Hviid Christensen, Haldor Topsøe

09:00-12:00 Group discussions

#### Grp. 1: Reduction of greenhouse gas emissions - chairman: Kurt Christensen, Haldor Topsøe

- **Biomass for fuels and power and solid oxide fuels cells as CO<sub>2</sub> mitigation technologies**  
John Bøgild Hansen, Haldor Topsøe
- **Chemical looping for CO<sub>2</sub> ready power and syngas generation**  
Tobias Pröll, Vienna University of Technology
- **Catalytic methane oxidation**  
Patrick Gelin, Institut de recherches sur la catalyse et l'environnement de Lyon

#### Grp. 2: Waste and biomass in power generation - chairman: Joakim Reimer Thøgersen, Haldor Topsøe

- **Dioxin formation and emission control**  
Alfons Buekens, Vrije Universiteit Brussel
- **Experience of co-combustion of biomass and waste in coal-fired power plants**  
Bo Sander, DONG Energy A/S
- **Hg behaviour in combustion flue gasses**  
Harald Thorwarth, EnBW Kraftwerke AG

#### Grp. 3: Engine emissions - chairman: Ioannis Gekas, Haldor Topsøe

- **Future legislation for marine vessel exhaust**  
Erik Fridell, Swedish Environmental Research Institute
- **Particulate control**  
Jay Almlie, Energy & Environmental Research Center® (EERC)
- **Current and future lean gasoline exhaust aftertreatment**  
Matthew Keenan, Ricardo

#### Closing session - chairman: Henrik Topsøe, Haldor Topsøe

12:00-13:00 **Perspectives on energy supply**  
Eric D Larson, Princeton Environmental Institute, Princeton University

Closing remarks: Jesper Nerlov, Haldor Topsøe

Lunch between 13:00 and 14:30