

# Closing in on Exhaust Gas Rinsing Chemistry

## Amminex Emissions Technology

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Having invented a novel technology for removing one of the most problematic substances from car exhaust gas, Amminex Emissions Technology A/S still sees fertile ground when it comes to gaining a better understanding of the materials, structures, and processes involved. To that end experiments performed at advanced facilities like ESS and MAX IV are likely to be of great value.

"The Imaging Industry Portal at DTU invited us to have preliminary experiments done at their lab. As the results were truly encouraging, this is a path we are keen to follow," says Dr Ulrich Quaade, head of research and development at Amminex Emissions Technology.

Nitrous oxides, or NO<sub>x</sub>, in exhaust gas from gasoline and diesel fuelled cars are known to be a major health problem related to excessive occurrence of several diseases especially in large cities. From a chemical viewpoint ammonia is an ideal remover of NO<sub>x</sub> as the reaction results in water and pure nitrogen, which is an abundant and harmless air component. However, using it for the purpose has presented a range of practical problems, since ammonia normally needs to be kept under high pressure.

### Neutrons and X-rays are equally relevant

The Danish company has patented a technology which stores ammo-

nia in a solid matrix, contains it safely, and enables controlled release. In other words, ammonia is released only in the amounts needed for doing the job of removing the current level of NO<sub>x</sub> from the vehicles' exhaust gas.

"Since we made the original inventions, we have been working on understanding the materials, structures, and processes involved and especially how the system performs under industrially relevant conditions," Ulrich Quaade explains.

"Preparing a sample and investigating it in, say, an electron-microscope will tell us a lot about the structure at meso-scopic level, which is highly relevant to us, but even more interesting will be to see the sample operating under actual working conditions. This is possible only using advanced neutron or X-ray facilities."

To this end both methods are equally relevant to Amminex Emissions Technology:

"Neutrons are ideal for identifying hydrogen, and as ammonia contains hydrogen, we will be able to follow the fate of ammonia during the experiment. However, X-rays are better when it comes to identifying the meso-scopic structure of the carrier matrix in our product. In other words, the two types of investigations supplement each other."



*The flow of ammonia is a key feature of our product. The experiments will allow us to identify "bottle necks" at meso-scopic level and improve flow rates. As the preliminary results were truly encouraging, this is a path we are keen to follow.*

Ulrich Quaade, head of research and development, Amminex Emissions Technology

### Identifying bottle necks

The new insight will be used for optimizing the system, according to Ulrich Quaade:

"The flow of ammonia – both into the system initially, and later out into the exhaust gas – is a key feature of our product. The experiments will allow us to identify "bottle necks" at meso-scopic level and improve flow rates."

The R&D director imagines that experiments will be done in cooperation with DTU and University of Copenhagen:

"We already have cooperation with groups at both universities in place, and having experiments done in Lund would be a natural extension. I would like to note that we are grateful for being introduced to the field by the Imaging Industry Portal at DTU. Had they not contacted us, I hardly think we would have considered approaching international synchrotron facilities by ourselves."

### New Horizons Are Opening to the Energy Sector

World leading facilities within neutron and X-ray scattering, the ESS and MAX IV, will open in the Oresund region over the next few years. However, there is no need to wait for these facilities to open. Scientists at Technical University of Denmark and University of Copenhagen are already in gear for X-ray and neutron scattering projects. These could either be full research projects in their own right or preliminary projects leading up to projects at existing or the coming large scale facilities. Contact the universities to learn more about what they can offer you.

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