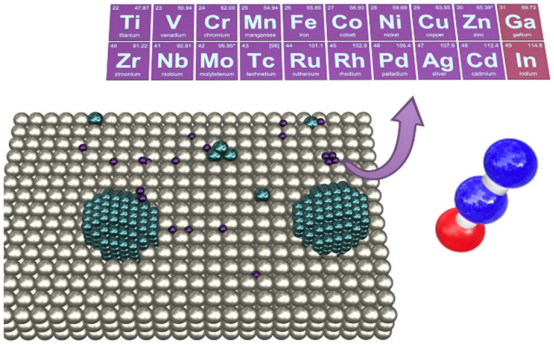
PAUL SCHERRER INSTITUT

Student Project

Applied Catalysis ad Spectroscopy group, Paul Scherrer Institut, 5232 Villigen

Bimetallic catalytic systems for decomposition of nitrous oxide (N_2O)



Ammonia (NH_3) holds significant potential as a fuel for the shipping industry due to its favorable chemical properties. However, the emissions of gases such as N_2O, which has a GWP value 298 times higher than CO_2, pose a significant obstacle for the utilization of NH_3 as a climate-friendly fuel. A particular challenge involves the low-temperature abatement of N_2O and the inhibition effect produced by H_2O and O_2. Extensive research has indicated that catalysts containing rhodium (Rh) are the most active in N_2O decomposition. Nevertheless, the role of the support and promoters, the use of bimetallic formulations, and the influence of the preparation method still need investigation. The effect of adding another metal and its influence on metal speciation is the particular interest as it could boost activity and stability.

The aim of this project is to synthesize a platform of bimetallic Rh-based catalysts, using different approaches to control the speciation and local structure of different metals and evaluate their performance for the decomposition of N_2O under realistic conditions (O_2 and H_2O). These results will guide efforts in the design of superior catalytic systems.

Tasks

- Synthesis of distinct matrix of catalysts based on ZrO_x and Rh.
- Characterization of synthesized materials using a variety of techniques (e.g. SEM, UV, H_2-TPR, O_2 chemisorption, N_2 physhisorption, PXRD, IR of CO adsorption, TEM)
- Perform catalytic activity test
- Perform lab-based *operando* experiments

Benefits

- Hands-on approach in the catalysis field: from synthesis and characterization to testing and understanding
- Gaining experience on spectroscopic operando techniques
- Gaining experience on writing scientific reports/presentations
- Work in international team

The work will be carried out in the Applied Catalysis and Spectroscopy group at the Paul Scherrer Institut (PSI) in Villigen**.**

Contacts

D. Cano-Blanco (daniel.cano-blanco@psi.ch); Dr D. Ferri (davide.ferri@psi.ch)