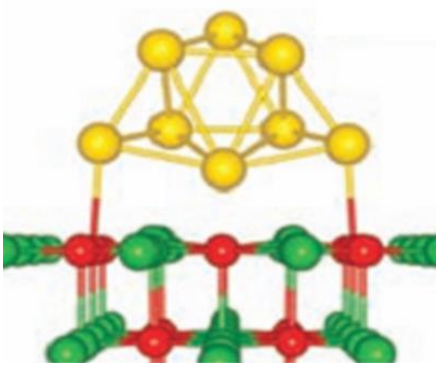
Applications of size controlled silver clusters in emissions control catalysis

MSc thesis project is currently available with the Competence Centre of Catalysis (KCK) at the Applied Surface Chemistry division under the direction of David Anderson and Professor Hanna Härelind.

Motivation



In recent years, atomically precise metal clusters have shown significant promise in various catalytic reactions due to their unique electronic properties; particularly when the cluster has dimensions under 2 nm. This project will utilize selected atomically precise silver clusters for the selective catalytic reduction of NOx, a significant pollutant in the automotive inductive. Sequestration of NOx emissions is an important target for many researchers and it is hoped that the application of size controlled silver clusters will help identify the optimal silver particle size to achieve significantly improved NOx conversion. This project intends to explore a fascinating application of atomically precise metal clusters on a significant and industrial relevant catalytic problem.

Project objectives

The project aims to study the influence of silver particle size on the selective catalytic reduction of NOx. A range of supported silver samples will be prepared with particles size ranging from sub 1 nm up to 40 nm. A range of bottom up synthetic methods may be explored to help achieve the ideal size control. The materials will be assessed for their performance as SCR catalytic for NOx. Student input on the design and implementation of this project will encouraged throughout the period of the project.

Learning objectives

- Literature overview of silver clusters in catalysis, particular focus on emissions control catalysis
- Synthesis and characterisation of novel, size controlled silver catalysts
  - Control of silver cluster size and shape
  - Control of support morphology
- Characterisation of materials before and after catalytic assessment
  - Silver particle size by transmission electron microscopy (TEM)
  - Surface composition by X-ray photoelectron spectroscopy (XPS)
  - Elemental composition by X-Ray fluorescence (XRF)
  - Total surface area by nitrogen storage (BET)
- Evaluation of the supported silver catalyst for a selected model reaction
- Oral and written presentation of the project.

Contacts

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