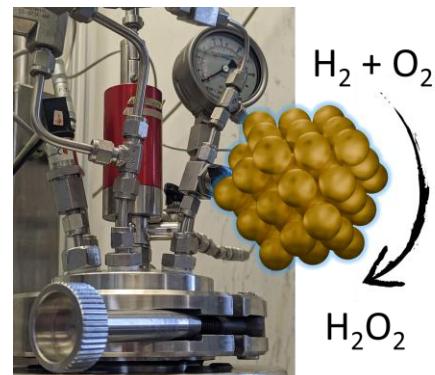


Master thesis / Bachelor thesis

Synthesis of nanoparticle and clusters as catalysts for the direct H_2O_2 synthesis

Motivation:

H_2O_2 is an environmentally friendly oxidizing agent that is produced on an industrial scale using the established anthraquinone process, which is only economical in large plants. Decentralized direct H_2O_2 production from H_2 and O_2 at the point of use offers major advantages, including savings in transport costs. Bimetallic PdAu catalysts are interesting, active, and selective materials for direct H_2O_2 synthesis. However, an understanding of their structure-activity relationships is necessary in order to develop high-performance catalysts. With conventional catalyst production methods, it is difficult to achieve sufficient control over catalyst parameters such as metal particle size, composition, and loading. We therefore use model catalysts obtained from monodisperse AuPd nanoparticles or novel cluster compounds to investigate the structure-activity relationships in direct H_2O_2 synthesis.



Current research topics:

We are developing and studying different catalyst materials for direct H_2O_2 synthesis. Some examples of topics for Bachelor or Master theses would be:

- Scale-up and optimization of colloidal syntheses for preparing bimetallic PdM catalysts (M e.g. Au, Ag) on carbon supports
- Investigation of structure-activity relationships for Pd@Au / Au@Pd (core-shell) nanoparticle catalysts in direct H_2O_2 synthesis
- Synthesis and characterization of novel bimetallic cluster compounds as catalyst precursors

Requirements:

- Interest in inorganic chemistry and heterogeneous catalysis, as well as knowledge of the basic concepts of inorganic synthesis
- Independent and conscientious approach to work

Further information:

We offer excellent opportunities to learn about the colloidal chemical synthesis of nanoparticles and cluster compounds and to gain practical experience in characterizing these materials and testing of the resulting catalysts.

Work on Bachelor or Master theses can be started anytime. If you are interested in one of the topics or in case of questions, please contact Heiko Schiefer (heiko.schiefer@kit.edu) or Vera Truttmann (vera.truttmann@kit.edu).