Inorganic Materials & catalysis

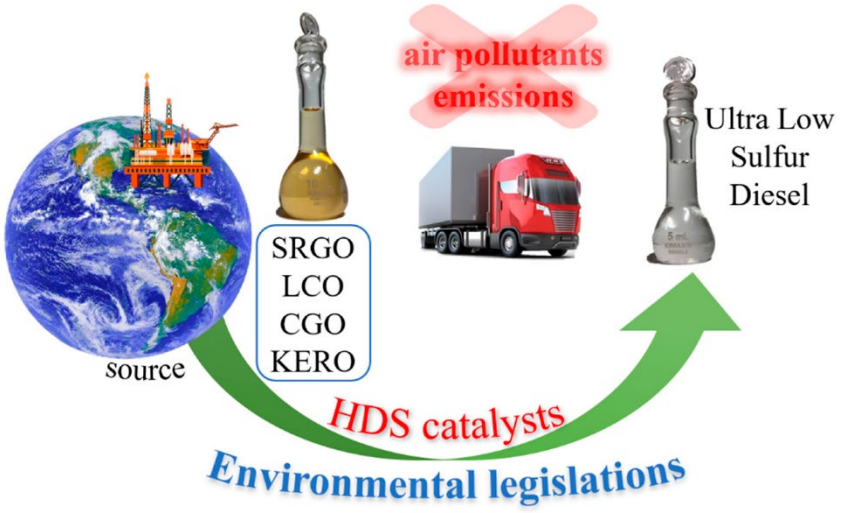
Research Project – **Mengyan Li/ Emiel Hensen/Thomas Weber**

IMC
INORGANIC MATERIALS & CATALYSIS

Influence of preparation condition on structure and performance of hydrodesulfurization NiMo/Al_2O_3 catalyst

Background

Due to tightening environmental legislation, the production of ultra-clean transportation fuels becomes mandatory and challenges existing refinery processes. Hydrotreating is an established technology to solve this problem by removing heteroatoms like S (HDS), N (HDN), O (HDO) and metals (HDM) from crude oil. Catalysts used for this purpose (ultra-low sulfur fuel production) are based on sulfided nickel- or cobalt-promoted molybdenum particles dispersed on a high surface area alumina carrier. It is believed that the Ni promoter atoms are located at the edges of MoS_2 nanoparticles and constitute the active sites in the so-called Ni(Co)MoS phase[1]. The NiMoS phase is the key component of an HDS catalyst and it determines catalysts activity and selectivity by its chemical nature, structure, particle size and particle morphology[2]. These properties can be engineered by choosing the right preparation conditions, however the direct influence of specific conditions or compounds used to formulate catalysts, on the structure and activity of the resulting active phase, is still unclear. Selected aspects of those will be explored in this project.



Research projects:

1. Influence of sulfiding agent on structure (particle size, stacking) and activity of NiMo/Al_2O_3 catalysts.
2. The effect of chelating ligand and additives on activity of NiMo/Al_2O_3 catalysts.

Analytical and characterization techniques used:

XRD, TEM, XPS, FTIR, UV-vis, GC, ICP, TPR-TPD, Raman, HDS

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1. van Haandel, L., Bremmer, G.M., Hensen, E.J.M. and Weber, Th. Influence of sulfiding agent and pressure on structure and performance of CoMo/Al_2O_3 hydrodesulfurization catalysts. Journal of Catalysis 342 (2016): 27-39.
2. van Haandel, L., Bremmer, G.M., Hensen, E.J.M. and Weber, Th. The effect of organic additives and phosphoric acid on sulfidation and activity of (Co) Mo/Al_2O_3 hydrodesulfurization catalysts. Journal of Catalysis 351 (2017): 95-106.