

# Fundamental Studies on the Synthesis of Supported Metal Catalysts

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**ETH Hönggerberg, HCI G3, 12/12/11, 17 h**

(The seminar will be followed by an Apéro)



## Abstract

Supported metal (oxide) catalysts are often prepared using impregnation, drying, calcination and, optionally, reduction. To unravel these 'elementary steps' of the synthesis of silica-supported Ni-, Co- and Cu-based catalysts, we have used ordered mesoporous silica as a model support (SBA-15) in combination with electron tomography (ET).

Impregnation of SBA-15 with aqueous solutions of Ni or Co nitrate provides virtually complete and uniform pore filling. Conventional drying brings about substantial redistribution of the precursor with only about half of the pores filled with metal nitrate deposits. Calcination in an NO/He flow led to small (4-5 nm) NiO or Co<sub>3</sub>O<sub>4</sub> nanoparticles. Following calcination quantitative inter-particle distance distributions, derived from ET, evidenced local active phase loadings of twice the nominal value.

Freeze drying, on the other hand, led to uniform distributions of both the metal nitrate precursor after drying and of the activated nanoparticles. For supported Cu catalysts used for methanol synthesis, results very different from those for Ni and Co were obtained and will be discussed in the seminar.

## Speaker highlights

Krijn P. de Jong (1954) obtained his BSc (1976), MSc (1978) and PhD (1982) degrees in chemistry, all cum laude, at Utrecht University. In 1987 he also obtained an MSc degree in chemical engineering from Twente University. From 1982-1997 he was with Shell Research working on catalyst preparation, heavy oil conversion, environmental processes, zeolite catalysis and synthesis gas production and conversion. In 1997 he was appointed as full professor of inorganic chemistry and catalysis at Utrecht University. His current research interests are catalyst preparation, nanostructured catalysts, hydrocarbon conversions over zeolites, catalysts for fine chemicals manufacture, conversion of synthesis gas and hydrogen storage. He has published about 200 scientific papers and 30 patents.

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