

Lecture:

## Porous organic frameworks containing platinum nanoparticles for silicon nanowire based chemical sensing

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Time: 11.00 h

Location: University of Twente, Carré 3A

### Abstract:

Porous organic frameworks (POFs) have been discovered recently, and are promising new materials for molecular separations, chemical sensing and catalysis. In this study we show the successful development of a chemical sensor, which is based on the covalent immobilisation of melamine-terephthaldehyde POFs on amino propyl modified silicon nanowires (SiNW). These nanowires were made by top down photo-lithography and act as a (nano-sized) field effect transistor (FET). Changes in the chemical composition of the immobilised POF (the selector layer) is directly monitored by the FET (the transducer) as a change of source-drain current or as a change of gate potential.

The POFs on top of the SiNW was post-synthesis functionalised by uniformly distributed platinum nanoparticles (PtNP) through impregnation using chloroplatinic acid, followed by *in situ* sodium boron hydride reduction. The obtained PtNP@POF-SiNW chemical sensor showed enhanced sensitivity for methanol vapor detection.

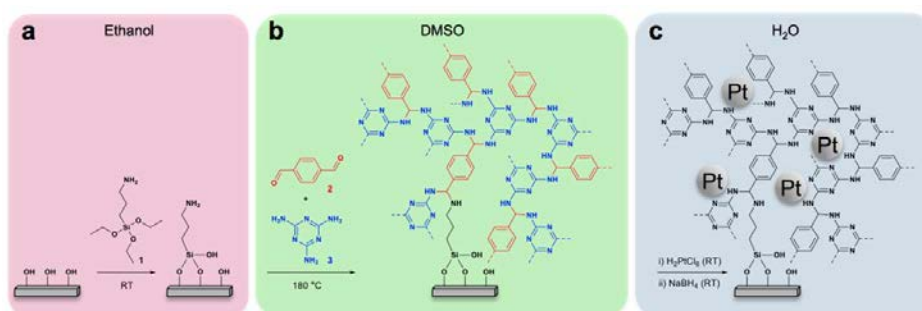


Figure 1: (a) Amino propyl modification of silicon nanowires via their surface silanol groups; (b) *in situ* formation of melamine-terephthaldehyde porous organic frameworks; and (c) post-synthesis modification with platinum nanoparticles.

### Reference:

Anping Cao, Meixia Shan, Laura Paltrinieri, Wiel Evers, Liangyong Chu, Lukasz Poltorak, Johan H. Klootwijk, Beatriz Seoane, Jorge Gascon, Ernst J. R. Sudhölter, and Louis C. P. M. de Smet, Enhanced vapor sensing using silicon nanowire devices coated with Pt nanoparticle functionalized porous organic frameworks, manuscript under review (2018).

### Curriculum vitae

Ernst Sudhölter studied chemistry at the University of Groningen, where he also obtained his PhD degree (cum laude) with Jan Engberts (1981). He was research chemist at the Royal/Dutch Shell Laboratories Amsterdam (-1984), before he was assistant/associate professor at University of Twente (-1990) with David Reinhoudt. In 1990 he became professor of Organic Chemistry at Wageningen University and moved to Delft University of Technology in 2007 to become chairman of the Chemical Engineering department (-2014) and professor of Organic Materials & Interfaces. His chemical research interests are in chemical surface modifications for chemical sensors and membrane separations and chemistry of surfactants.