Area-selective atomic layer deposition for bottom-up fabrication of nanoelectronics

Short description: The ability of precursor ligands to block the adsorption of other precursors will be studied using spectroscopic ellipsometry (SE) and X-ray photoelectron spectroscopy (XPS)

Background**:** To enable further downscaling of electronics following Moore's law, *bottom-up* fabrication schemes need to be introduced in the semiconductor industry. Semiconductor fabrication can be advanced drastically when it becomes possible to selectively add material *only* there where it is needed, instead of using the conventional top-down approach of removing excessive material. This strives for a new paradigm in the manufacturing of electronics, facilitating the continuation of Moore's law scaling for many more technology generations.

The focus of this project is on atomic layer deposition (ALD), a technique that enables layer-by-layer deposition of thin films with atomic-level control of the film thickness. ALD has recently become an important element of the semiconductor fabrication toolbox and being a true, enabling nanotechnology it is gaining ever more attention. The goal of this project is to make ALD growth *selective* to certain surfaces, such that the deposition only occurs at surfaces where it is needed.

Project**:** In the project you will investigate a three-step ALD cycle as shown in figure 1. The goal of the project is to find out how efficient the self-limiting adsorption mechanisms of an ALD precursor are for the blocking of other ALD precursors. Moreover, the influence of the size and reactivity of several precursor molecules on how much precursor adsorption can be blocked will be investigated. In this project you will work with ALD, SE and XPS and gain experience on working in a cleanroom facility.

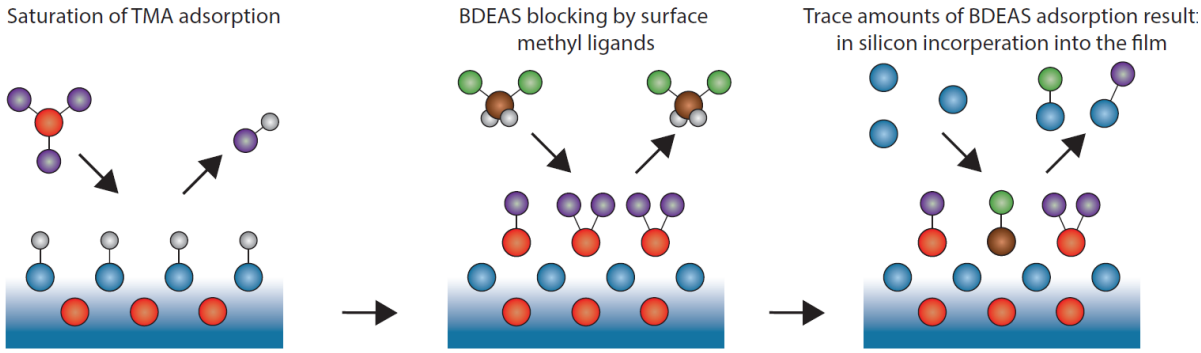

Fig. 1: *Schematic illustration of a three-step ALD process which suppresses the adsorption of molecules during the second step*

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Location and supervision**:** You will perform experiments in the cleanroom that is located in spectrum. You will be supervised by Marc Merkx and Adrie Mackus.