Nanolayers for semiconductor surface passivation

Short description: Investigation of ultrathin films and their interface with semiconductors to find strategies that reduce the electronic defect density at the semiconductor surface

Background: Semiconductors are found in nearly every electronic device (computers, smartphones, solar cells, …) and are therefore indispensable for today's society. One of the challenges of semiconductors is their surface. The surface of a semiconductor, which in a device often forms an interface with another material layer, exhibits typically a high density of electronic defects. These defects have detrimental effects on the device performance. In solar cells for example, defects facilitate the recombination of light-generated electrons and holes, which results in a lower efficiency. Reducing these surface defects (called *surface passivation*) is therefore essential.

Deposition of ultrathin passivating (inter)layers on semiconductors is an effective strategy to reach low surface defect densities and thereby improve devices. The high-tech thin film deposition techniques that are used within the PMP group are ideal for this purpose.

Project: The aim of the project is to study the surface passivation of semiconductors such as Silicon, Germanium, or Indium phosphide by ultrathin films deposited by Atomic Layer Deposition (ALD) and Chemical Vapor Deposition (CVD). The project will include the deposition of such thin films, the interface and material characterization of these films, the investigation of surface treatments, but also theoretical work on all the interesting physics involved! One can emphasize either of these aspects in the project depending on personal interest. A typical example of a surface passivation study can be found in the reference below. Besides this, it is good to know that there is strong support during the project, a very pleasant group, and a lot of opportunities for your own initiatives.

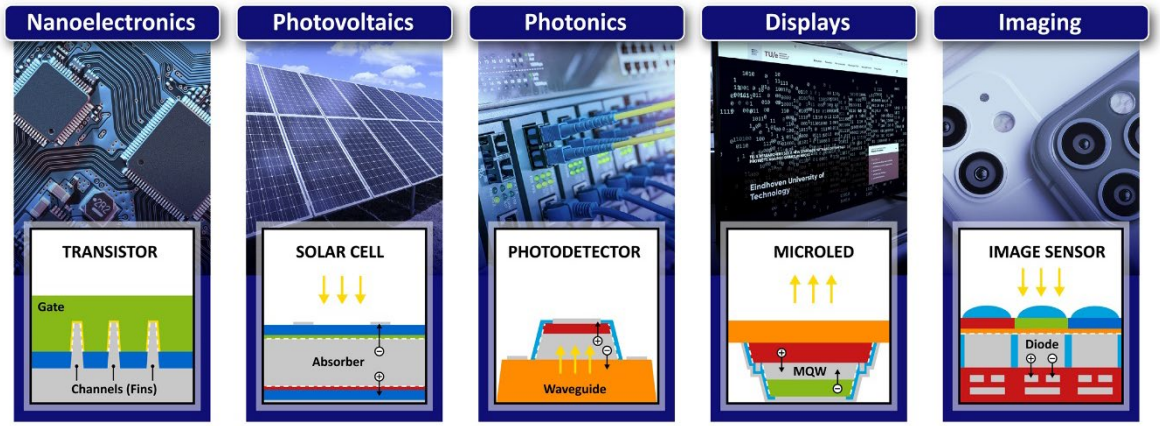

Fig. 1: *Overview of technologies in which surface passivation is important. The dashed lines in the schematics display the electronic defect density on the semiconductor (grey areas) surface.*

If interested please contact:

Bart Macco:	**Flux 3.112**	**b.macco@tue.nl**
Erwin Kessels:	**Flux 3.092**	**w.m.m.kessels@tue.nl**

Location and supervision: You will perform experiments in the cleanroom that is located in spectrum. You will be supervised by Bart Macco or Erwin Kessels.