Monday Morning, June 27, 2022

Plenary Session

Room Auditorium - Session PS-MoM1

Plenary Session I

Moderators: Christophe Detavernier, Ghent University, Belgium, Erwin Kessels, Eindhoven University of Technology, Netherlands

9:00am **PS-MoM1-2 Plenary Lecture: New Process Requirements Driven by More Than Moore and More Moore Device Integration Innovations**, ***Steven Steen,*** ASML*; P. Leray,* IMEC, Belgium **INVITED**

Over fifty years of semiconductor innovation has targeted transistor device scaling in order to sell ever increasing functional performance at equivalent cost per function. This relentless drive for miniaturization and functional integration on Silicon has been described by Gordon Moore [1] and has colloquially become *Moore's law*. Continued scaling will bring new challenges in process and integration that will enable "more Moore". An orthogonal trend in the industry captured under the designation of "More than Moore" focuses on the continued cost and density scaling through other means than just geometric scaling. The non-volatile memory segment has been the first to

transition from 2D to 3D devices to enable continued NAND bit cost scaling. The additional performance scaling levers are being considered for DRAM and Logic and will introduce new dimensions to process requirements. The approach to the wider innovation will be expected to deliver the promise of continued performance, cost and functionality improvements for the next decades. In this presentation we will discuss "more Moore" and "more than Moore" device technologies and show how these bring new process integration challenges.

9:45am **PS-MoM1-5 ALD 2020 Innovator Awardee Talk: Innovations in ALD Chemistry Open the Door to Applications**, ***Mikko Ritala,*** University of Helsinki, Department of Chemistry, Finland **INVITED**

The success of ALD is built on chemistry. Whenever one wants to exploit the unique benefits of ALD with a new thin film material, proper precursors fulfilling the ALD criteria must be found for that material. Often new chemistry is needed for also those materials that have already earlier been deposited by ALD because the existing processes are not compatible with the new application. The connection works also the other way: once a new material and process is added to the ALD portfolio, it may be adopted into applications other than that originally possibly developed for. This talk will make an overview of development of ALD chemistry from the past to the future. Through selected examples it will be shown how innovations in precursor chemistry have made it possible to exploit ALD in new applications. Challenges, opportunities and directions for the ALD chemistry development and research will be discussed.

ALD processes consist of two or more precursors. Accordingly, breakthrough innovations can be made through metal precursors, non-metal precursors, and the ways how these are combined. Examples will show all three approaches being used. Area selective ALD adds further needs and possibilities for innovations, like area selective etching of polymers.

Knowledge on ALD processes progresses through different levels. The first and also the most important one is finding the chemistry that deposits the desired film, while higher levels add progressively our understanding on that how the chemistry actually works. While the former is straightforward to test, the latter is much more challenging and rarely fully complete. Examples of successful reaction mechanism studies from the past and an outlook to the future will be given.

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