Abstract
Area-selective atomic layer deposition (AS-ALD) is envisioned to play a key role in next-generation semiconductor processing and can also provide new opportunities in the field of electronic devices. Basics concept of AS-ALD is that an original surface is changed to activated and deactivated surfaces toward following ALD reactions, resulting in selective growth in one substrate. In most cases, deactivation of surface is a common way to control ALD growth, and special inhibitors for the surface deactivation have been proposed. In this presentation, various types of inhibitors reported will be reviewed and the next progress of AS-ALD for high volume manufacturing (HVM) will be discussed.

Self-assembled monolayer (SAMs) is the first proposed material as an inhibitor of AS-ALD. AS-ALD using SAMs has been extensively studied in various kinds of ALD materials and has shown some feasibilities to block growth of ALD. Polymer layers have been proposed as another approach. However, SAMs and polymers have several disadvantages in compatibility for HVM, such as long formation time, complex process sequence, and clean removal. Recently, our group has developed an AS-ALD using precursor type inhibitors and shown feasibilities of blocking properties in Ru and Pt ALD systems. In the following work, we investigated surface reactions during the adsorption of inhibitor and blocking processes using water contact angle measurement, density functional theory (DFT), and X-ray photoelectron spectroscopy (XPS). The results could provide insights in the next generation patterning process using ALD.