On Demand

Atomic Layer Etching
Room On Demand - Session ALE8

Integration of ALD + ALE

ALE8-1 Simultaneous Selective Deposition and Etching of Ru for Atomic Layer Processing of SiO_2, ***Sumaira Yasmeen,*** *B. Ko, B. Gu, H. Lee,* Incheon National University, Korea (Republic of)

Nanofabrication is facing multiple challenges, such as patterning limits and transition to 3D structures, with the downscaling of devices to sub-5nm scale. To overcome the existing challenges, area-selective atomic layer deposition (AS-ALD) has surfaced as a promising candidate for a toolbox of nanofabrication. In our previous work, we introduced a Si precursor type inhibitor using bis(methylamino)dimethylsilane (DMADMS) and it showed reliable AS-ALD with high process compatibility with current unit processes of nanofabrication. In this work, the AS-ALD is extended to a multipurpose process that DMADMS is used as a Si inhibitor as well as precursor for SiO_2 ALD using ozone as an oxidant. In addition, AS-ALD Ru process is also integrated into the SiO_2 process as a supporting layer for oxidation protection and lateral growth control. In a detailed process, the experiments are designed in such a way that DMADMS inhibitor is first adsorbed selectively on SiO_2 surface. After DMADMS inhibitor adsorption, Ru AS-ALD process is carried out and Ru is selectively deposited on Cu surface only, given that DMADMS can efficiently block Ru ALD. In the following process, SiO_2 AS-ALD process is performed by oxidizing DMADMS inhibitor by ozone counter reactant. A SiO_2 film nucleates solely on SiO_2 surface, while ozone etches out the AS-ALD Ru from the Cu surface simultaneously. In this way, self-aligned nanopatterns can be formed without additional plasma dry etching processes and photolithography. This combined atomic layer processing is believed to be an example to show effective integration and applicability of AS-ALD into the current nanofabrication technology.

Author Index

Bold page numbers indicate presenter