Ruthenium Thin Films Grown by Atomic Layer Deposition

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Abstract : Ruthenium is one of the noble metals having good thermal and chemical stability, low resistivity, and relatively high work function(4.71eV). Because of these good physical, chemical, and electrical properties, Ru thin films have been extensively studied for various applications in semiconductor devices such as gate electrode for FET, capacitor electrodes for dynamic random access memories(DRAMs) with high-k dielectrics such as Ta_2O_5 and $(Ba,Sr)TiO_3$, and capacitor electrode for ferroelectric random access memories(FRAMs) with $Pb(Zr,Ti)O_3$. Additionally, Ru thin films have been studied for copper(Cu) seed layers for Cu electrochemical plating(ECP) in metallization process because of its good adhesion to and immiscibility with Cu.

We investigated Ru thin films by thermal ALD with various deposition parameters such as deposition temperature, oxygen flow rate, and source pulse time. Ru thin films were grown by ALD(Lucida D100, NCD Co.) using RuDi as precursor and O_2 gas as a reactant at 200~350°C.

Key Words : ALD, Ru, Electrode, Cu, Seed layer