Ru and RuO_2 Thin Films Grown by Atomic Layer Deposition

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Abstract : Metal-Insulator-Metal(MIM) capacitors have been studied extensively for next generation of high-density dynamic random access memory (DRAM) devices. Of several candidates for metal electrodes, Ru or its conducting oxide RuO_2 is the most promising material due to process maturity, feasibility, and reliability. ALD can be used to form the Ru and RuO2 electrode because of its inherent ability to achieve high level of conformality and step coverage. Moreover, it enables precise control of film thickness at atomic dimensions as a result of self-limited surface reactions. Recently, ALD processes for Ru and RuO_2, including plasma-enhanced ALD, have been studied for various semiconductor applications, such as gate metal electrodes, Cu interconnections, and capacitor electrodes.
We investigated Ru/RuO_2 thin films by thermal ALD with various deposition parameters such as deposition temperature, oxygen flow rate, and source pulse time. Ru and RuO_2 thin films were grown by ALD(Lucida D150, NCD Co.) using RuDi as precursor and O2 gas as a reactant at 200~350°C.

Key Words : ALD, Ru, RuO_2, Electrode, Cu