# 유도결합플라즈마를 이용한 TaN 박막의 식각 특성

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# Etching Property of the TaN Thin Film using an Inductively Coupled Plasma

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**Abstract** : Critical dimensions has rapidly shrunk to increase the degree of integration and to reduce the power consumption. However, it is accompanied with several problems like direct tunneling through the gate insulator layer and the low conductivity characteristic of poly-silicon. To cover these faults, the study of new materials is urgently needed. Recently, high dielectric materials like $Al_2O_3$, $ZrO_2$, and $HfO_2$ are being studied for equivalent oxide thickness (EOT). However, poly-silicon gate is not compatible with high-*k* materials for gate-insulator. To integrate high-*k* gate dielectric materials in nano-scale devices, metal gate electrodes are expected to be used in the future. Currently, metal gate electrode materials like TiN, TaN, and WN are being widely studied for next-generation nano-scale devices. The TaN gate electrode for metal/high-*k* gate stack is compatible with high-*k* materials. According to this trend, the study about dry etching technology of the TaN film is needed.

In this study, we investigated the etch mechanism of the TaN thin film in an inductively coupled plasma (ICP) system with $O_2/BCl_3/Ar$ gas chemistry. The etch rates and selectivities of TaN thin films were investigated in terms of the gas mixing ratio, the RF power, the DC-bias voltage, and the process pressure. The characteristics of the plasma were estimated using optical emission spectroscopy (OES). The surface reactions after etching were investigated using X-ray photoelectron spectroscopy (XPS) and auger electron spectroscopy (AES).

**Key Words** : Etch, TaN, Metal electrode, plasma, ICP