

[III~15]

Surface Structure of TiN Films by Ion Beam Processing

***Kyung-youl Min and Kazuhiro Yoshihara**

Surface and Interface Division, National Research Institute for Metals,
Tsukuba, Ibaraki 305, Japan

Ryuichi Shimizu

Department of Applied Physics, Osaka University, Suita, Osaka 565, Japan

Correlation between the surface structure of ion beam processed TiN film and irradiated ion dose was studied by reflection high energy electron diffraction (RHEED) and ion scattering spectroscopy (ISS). Changes of the surface crystalline structure and surface composition were monitored by RHEED and ISS, respectively, during nitrogen ion beam irradiation onto the titanium film. At the very initial stage, the TiN(110)-oriented phase appears first but changes to TiN(110)- and TiN(100)-oriented mixed phase as ion beam proceeds. Finally, the surface crystalline structure becomes of TiN(100)-oriented phase at the steady state, e.g., above $\sim 3 \times 10^{16}$ N₂⁺ ions/cm² for 3 keV N₂⁺ ions. Furthermore, we have confirmed that the high reactivity between irradiated nitrogen ions and titanium atoms results in an anomalous sputtering process. The sputtering undergoes 3 processes, associated with the relevant changes of surface crystalline structure: (1) almost no sputtering takes place in the initial stage, (2) the sputtering yield, then, increases until it becomes saturated at the steady state. This anomalous sputtering behavior is also associated with the changes of surface composition observed by ISS using mixed He⁺ ions and N₂⁺ ions irradiation.

* TEL: +81-298-53-1239, FAX: +81-298-53-1093, e-mail: minky@nrim.go.jp