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Abstracts

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Dependence of Corrosion-Resistance of Ti(NO$_3$), Films on Bias Voltage Produced by Dynamic PIII-IBED

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Dynamic plasma-based thin film deposition incorporating ion mixing and plasma immersion is an effective technique to synthesize nitride-based hard films. We have fabricated Ti(NO$_3$), films using filtered titanium vacuum arc in a nitrogen plasma environment. A pulsed high voltage is applied to the target for a short time when the metallic arc is fired to effect both plasma deposition and ion mixing. In this work, we investigate the dependence of the corrosion resistance of the treated samples on the applied voltage. Our Auger results reveal an oxygen rich surface film due to the non-UHV conditions and high affinity of oxygen to titanium. The corrosion current is reduced by two orders of magnitude compared to the sample processed at 8 kV to the untreated sample. Our results disclose the unexpected results that a higher voltage (22 kV) may in fact be undesirable. The pitting potential diminishes substantially although the corrosion current is similar to that observed for the 8 kV sample. The polarization test is consistent with our SEM observation further illustrating the difference in the pitting distribution and appearance. The mechanism of this voltage influence on the corrosion resistance will be discussed in this paper.

Two-Switch High Voltage Modulator for Plasma-Based Ion Implantation

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This paper describes a new type of pulse modulator for plasma-based ion implantation (PBI). The applied target-voltage of conventional modulators has been strongly influenced by a load impedance consisting of an ion sheath formed by voltage application, plasma itself and the target configuration. The stray capacitance in the modulator system is also a factor influencing the applied voltage. A typical phenomenon of the load effect of the applied voltage is an existence of the voltage tail in a waveform of the target voltage due to the sheath collapsing and the voltage tail lasts several tens of microseconds, although a main switch of the modulator is in off-state. A target-current waveform is drastically changes due to the stray- and sheath- capacitances and output impedance of the modulator. We have developed a new pulse-modulator that is not influenced by the load impedance. The modulator has features (1) output impedance of the modulator is enough low to avoid the influence of the load impedance to realize a fast rise of the applied voltage, (2) a new closing-switch for short of the sheath impedance is separately installed, which operates during the time region that the main switch is off in order to promote a discharge of the charged stored in the stray- and ion sheath- capacitance. The new modulator would contribute to uniform ion implantation and processing by PBI and high frequency operation of PBI.