

Nucleation and growth mechanism of nitride films deposited on glass by unbalanced magnetron sputtering

Min J. Jung*, Kyung H. Nam and Jeon G. Han

Center for Advanced Plasma Surface Technology,

Sung Kyun Kwan University, 300 Chunchun-dong, Jangan-gu, Suwon 440-746 Korea

Nitride films such as TiN, CrN etc. deposited on glass by PVD processes have been developed for many industrial applications. These nitride films deposited on glass were widely used for not only decorative and optical coatings but also wear and corrosion resistance coatings employed as dies and molds made of glass for the example of lens forming molds. However, the major problem of nitride coatings on glass by PVD process is non-uniform film owing to pin-hole and micro crack. It is estimated that non-uniform coating is influenced by a different surface energy between metal nitrides and glass due to binding states. In this work, therefore, for the evaluation of nucleation and growth mechanism of nitride films on glass TiN and CrN film were synthesized on glass with various nitrogen partial pressure by unbalanced magnetron sputtering. Prior to deposition, for the examination of relationship between surface energy and film microstructure plasma pre-treatment process was carried out with various argon to hydrogen flow rate and substrate bias voltage, duty cycle and frequency by using pulsed DC power supply. Surface energy owing to the different plasma pre-treatment was calculated by the measurement of wetting angle and surface conditions of glass were investigated by X-ray Photoelectron Spectroscopy(XPS) and Atomic Force Microscope(AFM). The microstructure change of nitride films on glass with increase of film thickness were analyzed by X-Ray Diffraction(XRD) and Scanning Electron Microscopy(SEM).