Characterization of TiO_2 thin films elaborated via atmospheric pressure plasma: influence of the plasma gas composition

Seongchan kang[1], Rodolphe Mauchauffé[2], and Se Youn Moon[1,2]

[1]*Department of Applied Plasma Engineering, Chonbuk National University, Jeonju, Republic of Korea*

[2]*Department of Quantum System Engineering, Chonbuk National University, Jeonju, Republic of Korea*

Nowadays, titanium dioxide (TiO_2) is being widely investigated for its interesting physical, chemical and optical properties and for its various industrial applications, such as high refractive index coatings, anti-corrosion coatings and photocatalytic coatings. Thanks to the strong interest for TiO_2 thin films deposition for industrial application, various methods of fabrication are developed. Among the several TiO_2 thin films deposition methods, i.e. CVD (Chemical vapor Deposition), PVD (Physical Vapor Deposition), PECVD (Plasma Enhanced Chemical Vapor Deposition) and APP-CVD (Atmospheric Pressure Plasma-Chemical Vapor Deposition), the latter one is a promising method for low-cost and in-line deposition because of its atmospheric pressure processing and fast deposition rate. Despite the successful deposition of TiO_2 thin films by APP-CVD, studies on the TiO_2 thin films growth mechanism using various plasma gases are still lacking and thus a thoughtful investigation is necessary.

In this work, we studied the chemical composition and morphology of thin films deposited using a helium/argon/titanium isopropoxide (TTIP) gas mixture. To do so, the He/Ar/TTIP ratio is tuned and both the thin films surface chemistry, morphology and plasma chemistry are investigated using X-Ray Photoelectron Spectroscopy (XPS), Scanning Electron Microscope (SEM) and Optical Emission Spectroscopy (OES) respectively.