SM-P006

Applications of Ar Gas Cluster Ion Beam Sputtering to Ta_2O_5 thin films on SiO_2/Si (100)

Chanae Park[1], HongChol Chae[2], Hee Jae Kang[1]*

[1]Department of Physics, Chungbuk National University, Cheongju, 361-763, Korea, [2]Center for Research facility, Chungbuk National University, Cheongju, 361-763, Korea

Ion beam sputtering has been widely used in Secondary Ion Mass Spectrometry (SIMS), X-ray Photoelectron Spectroscopy (XPS), and Auger Electron Spectroscopy (AES) for depth profile or surface cleaning. However, mainly due to severe matrix effects such as surface composition change from its original composition and damage of the surface generated by ion beam bombardment, conventional sputtering skills using mono-atomic primary ions with energy ranging from a few hundred to a thousand volts are not sufficient for the practical surface analysis of next-generation organic/inorganic device materials characterization. Therefore, minimization of the surface matrix effects caused by the ion beam sputtering is one of the key factors in surface analysis.

In this work, the electronic structure of a Ta_2O_5 thin film on SiO_2/Si (100) after Ar Gas Cluster Ion Beam (GCIB) sputtering was investigated using X-ray photoemission spectroscopy and compared with those obtained via mono-atomic Ar ion beam sputtering. The Ar ion sputtering had a great deal of influence on the electronic structure of the oxide thin film. Ar GCIB sputtering without sample rotation also affected the electronic structure of the oxide thin film. However, Ar GCIB sputtering during sample rotation did not exhibit any significant transition of the electronic structure of the Ta_2O_5 thin films. Our results showed that Ar GCIB can be useful for potential applications of oxide materials with sample rotation.

Keywords: Ion Beam Sputtering, Gas Cluster Ion Beam Sputtering, GCIB sputtering, Oxide thin films, Ta_2O_5, XPS