Inductive coupled plasma reactive ion etching characteristics of Ta thin films for hard mask applications

최지현, 아드리안, 황수민, 정지원†
인하대학교 화학공학과
(cwchung@inha.ac.kr†)

Ta can be used as a hard mask in plasma etching in order to transfer patterns (i.e. MTJ stacks etching) and metal electrode due to its capability to withstand high temperature and strong adhesion compared to the conventional organic photoresist mask. However, very few papers describe in detail the etch profile and mechanism of Ta thin films, especially evidence of a redeposition free anisotropic etch profile is rare. Development of nano scale anisotropic etching process of Ta thin films is necessary for its future applications in MTJ stacks as a hard mask materials.
In this paper we investigate the inductively coupled plasma reactive ion etching of Ta thin films. Etch rate and etch profile for a variety of gases (Cl2, C2F6, Ar etc), the effect of etch parameters including coil rf power, dc-bias voltage, gas pressure and gas concentration on the etch profile and etch mechanism were investigated. The etch rates were obtained using a surface profilometer and etch profiles were observed by using a field emission scanning electron microscopy. The surface chemistry and etch mechanism were analyzed by using OES and XPS analysis.