Electronic and Optical Properties of Aluminum Oxide Before and After Surface Reduction by Ar+ Bombardment

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Abstrak

The electronic and optical properties of a-Al2O3 after induced by 3-keV Ar+ sputtering have been studied quantitatively by use of reflection electron energy loss spectroscopy (REELS) spectra. The band gap values of a-Al2O3 was determined from the onset values of the energy loss spectrum to the background level of REELS spectra as a function of time Ar+ bombardment. The bandgap changes from 8.4 eV before sputtering to 6.2 eV after 4 minutes of sputtering.The optical properties of α-Al2O3 thin films have been determined by comparing the experimental cross section obtained from reflection electron energy loss spectroscopy with the theoretical inelastic scattering cross section, deduced from the simulated energy loss function (ELF) by using QUEELS-ε(k)-REELS software. The peak assignments are based on ELF and compared with reported data on the electronic structure of α-Al2O3 obtained using different techniques. The results demonstrate that the electronic and optical properties before and after surface reduction will provide further understanding in the fundamental properties of α-Al2O3 which will be useful in the design, modeling and analysis of devices applications performance.