Optical Properties of Al2O3 Thin Films by Oxygen Ion Beam Assisted Pulse Reactive Magnetron Sputtering

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The Al2O3 films were deposited on polyimide substrates using oxygen ion beam assisted pulse reactive magnetron sputtering in which the oxygen ion beam were produced from anode type linear ion source. The objective of this work is to study and understand the influence of ion beam current on optical properties of Al2O3 films. The optical characteristics of films were studied by the transmittance spectroscopy measurement, the effect of deposition parameters on the refractive index, extinction coefficient and deposition rate of the films is analyzed. The composition and structure of the films are measured by X-ray diffraction (XRD) and X-ray photoelectron spectroscopy. The results indicate that the metal phase seriously affects the optical characteristics of films in the process of oxygen ion beam assisted pulse reactive magnetron sputtering. Based on the effective medium theory, the content of metal phase have been calculated which should be less than 5%. The ion energy, ion source discharge current, oxygen content, sputtering power are major parameters which affect Al2O3 films deposition rate, composition and optical characteristics. The Al2O3 films which have maximum refractive index and minimum extinction coefficient were deposited at 300V ion source discharge voltage, 0.85A ion source discharge current, more than 86% oxygen content and 600W magnetron target power.

Keywords
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