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Influence of the Ion Beam Current on Microstructures and 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 the microstructures and optical properties of Al₂O₃ films. Characterization of the films with X-ray (XRD) and X-ray photoelectron spectroscopy (XPS) revealed that with increasing ion beam current to 0.85 A, the films came into totally oxidation and were kept in amorphous state. The optical characteristics of Al₂O₃ films were studied by the transmittance spectroscopy measurement. We found that Al₂O₃ thin films with stoichiometric at the ion beam current of 0.85 A had the highest refractive index and the lowest extinction coefficient. As the ion beam current further increased, refractive index became lower and extinction coefficient came into higher. The deposition rate firstly increased gradually, reached the maximum with ion beam current of 0.85 A and then saturated with increasing the ion beam current.

Keywords

Oxygen ion beam
Pulse reactive magnetron sputtering
Al₂O₃ films
Ion beam current
Polyimide