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Fabrication of Organic-Inorganic Superlattice Films Toward Potential Use For Gas Diffusion Barrier

윤관현, Subas Kumar Muduli, 성명모

한양대학교 화학과

We fabricated organic-inorganic superlattice films using molecular layer deposition (MLD) and atomic layer deposition (ALD). The MLD is a gas phase process in the vacuum like to atomic layer deposition (ALD) and also relies on a self-terminating surface reaction of organic precursor which results in the formation of a monolayer in each sequence. In the MLD process, 'Alucone' is very famous organic thin film fabricated using MLD. Alucone layers were grown by repeated sequential surface reactions of trimethylaluminum and ethylene glycol at substrate temperature of 80°C. In addition, we developed UV-assisted Al₂O₃ with gas diffusion barrier property better than typical Al₂O₃. The UV light was very effective to obtain defect-free, high quality Al₂O₃ thin film which is determined by water vapor transmission rate (WVTR).

Ellipsometry analysis showed a self-limiting surface reaction process and linear growth of each organic, inorganic film. Composition of the organic films was confirmed by infrared (IR) spectroscopy. Ultra-violet (UV) spectroscopy was employed to measure transparency of the organic-inorganic superlattice films. WVTR is calculated by Ca test. Organic-inorganic superlattice films using UV-assisted Al₂O₃ and alucone have possible use in gas diffusion barrier for OLED.

Keywords: Atomic Layer Deposition (ALD), Water Vapor Transmission Rate (WVTR), Gas diffusion barrier, Al₂O₃, Alucone