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SiOx Barrier Film Deposition on PET by Using a Linear Deposition Source

Do-Geun Kim[1], Yong-Jin Kang[1], Seunghun Lee[1], Jong-Kuk Kim[1]

[1]Korea Institute of Materials Science, Changwon, South Korea

dogeunkim@kims.re.kr

SiOx barrier films were coated on 133 μm-polyethylene terephthalate (PET) films by using a linear deposition source (LDS) equipped roll-to-roll coater. The LDS generated closed drifting electrons in a large width up to 1.5 meter and dissociated deposition precursors, hexamethyldisiloxane (HMDSO) monomer and oxygen molecule for a plasma polymerization. Dynamic deposition rates as high as 90 nm*m/min were archived at the source-substrate distance of 120 mm. The SiOx films have different bonding structures as a function of HMDSO/(HMDSO+O_2) ratio from 3.7 to 14.2 %. As the HMDSO ratio was decreases X-ray photoelectron spectroscopy showed the peak shift of Si 2p from 102.1 to 103.4 eV corresponding to the increases of oxygen contents in $Si(-O)_x$ bonding. And Fourier transform infrared spectroscopy showed that the infrared absorption at 1254 cm^{-1} corresponding to CH_3 symmetric bending in $Si(CH_3)_x$ were decreased at the lower HMDSO content due to the active oxidation of HMDSO fragments such as C and H. CH emission (434.1 nm) in optical emission spectroscopy was also decreased at the lower HMDSO content. The roughness (R_a) of SiOx films on PET was in range of 0.3~0.5 nm, which was increased at the higher HMDSO ratio.

Keywords
Barrier Coating
PECVD
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Roll-to-Roll