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Low Temperature PECVD for SiOx Thin Film Encapsulation

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Organic light-emitting diode (OLED) displays have promising potential to replace liquid crystal displays (LCDs) due to their advantages of low power consumption, fast response time, broad viewing angle and flexibility. Organic light emitting materials are vulnerable to moisture and oxygen, so inorganic thin films are required for barrier substrates and encapsulations.[1-2].

In this work, the silicon-based inorganic thin films are deposited on plastic substrates by plasma-enhanced chemical vapor deposition (PECVD) at low temperature. It is necessary to deposit thin film at low temperature. Because the heat gives damage to flexible plastic substrates. As one of the transparent diffusion barrier materials, silicon oxides have been investigated. SiO_x have less toxic, so it is one of the more widely examined materials as a diffusion barrier in addition to the dielectric materials in solid-state electronics [3-4]. The SiO_x thin films are deposited by a PECVD process in low temperature below 100°C. Water vapor transmission rate (WVTR) was determined by a calcium resistance test, and the rate less than $10.^{-2}g/m^2$ •day was achieved. And then, flexibility of the film was also evaluated.

Keywords: Plasma Enhanced Chemical Vapor Deposition (PECVD), Low Temperature Thin Film Encapsulation (TFE), Silicon Oxide (SiOx)

PW-P017

Hydroxyl Radical Species Generated by Non-thermal Direct Plasma Jet and Their Qualitative Evaluation

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Reactive oxygen and nitrogen species (RONS) can be generated by using non-thermal atmospheric pressure plasma jet which have profound biomedical applications [1, 2]. In this work, reactive oxygen species like hydroxyl radical (OH) are generated by using non-thermal direct plasma jet above water surface using Ar gas and their properties have been studied using ultraviolet absorption spectroscopy. OH radicals are found to be generated simultaneously with the discharge current with concentration of 2.7 × 1015 /cm3 at 7mm above water surface while their persistence time have been measured to be 2.8 μS. In addition, it has been shown that plasma initiated ultraviolets play a major role to generate RONS inside water. Further works are going on to measure the temporal behavior of OH and O2*-.

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[2] Kim, Y.H. et al, Measurement of reactive hydroxyl radical species inside the biosolutions during non-thermal atmospheric pressure plasma jet bombardment onto the solution, Plasma Chem Plasma Process 34, 457 (2014)

Keywords: non-thermal plasma, reactive oxygen and nitrogen species, plasma initiated ultraviolet photolysis, OH lifetime