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Abstract
The Organic Light Emitting Diode(OLED) was extensively studied due to its superior properties of low cost, simple structure, wide viewing angles and low power consumption etc. It has been praised as the mainstream of displays for next generation. However, nowadays, the life-time of OLED is too short for commercial applications, and one of the significant issues for its degradation is the permeation of oxygen and water vapor into OLED. In this study, we use a novel technique for OLED passivation which composed of Si and SiOx. In this multilayer passivation, the SiOx layer is used as a barrier layer, and the Si layer is used as a reaction agent for trapping the oxygen and water vapor permeated through SiOx layer. In order to promote the film qualities, a reactive radio frequency magnetron sputtering system was employed to prepare Si/SiOx films. The effects of process parameters such as the concentration of oxygen, the power of sputtering and the pressure of chamber on the film growth were investigated. The results show that lower concentration of oxygen, higher sputtering power and lower process pressure improve the resistance of films against water vapor permeation. The best conditions for Si/SiOx films with low H2O permeation and high transparency in this study are O2 concentration of 10%, sputtering power of 150W, process pressure of 6.45 mtorr for Si and 8.15 mtorr for SiOx respectively. The OLED was then passivated with the Si/SiOx multilayer thin films to evaluate its performance.
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