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Encapsulation of Flexible OLED with an Auxiliary Sealing Line

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Abstract : Flexible OLED is an important technology for the next generation display over various kinds of applications. However, the organic materials of OLEDs degrade rapidly under the invasion of oxygen and water moisture. The degradation causes the formation of non-emitting areas which gradually suppress the device brightness, ultimately the lifetime of the device decreasing rapidly. Until now, the most suitable sealing process of the flexible OLED devices is a thin film encapsulation (TFE). However, TFE consists of a multilayer thin-film structure with organic-inorganic materials, so the cost is expensive and the process time is long. Another problem is that the blocking characteristics from the moisture and oxygen are not perfect. Therefore, the encapsulation of the flexible OLED device is a still key technical issue for the successful market entry. In this study, we are to introduce an auxiliary sealing line between the two flexible substrates. The electrode lines were formed on the substrates which have a SiNx barrier coating layer. To induce the solid phase diffusion process between the SiNx layer and the electrode lines, the electrode materials were determined as Al-Si composition. Thermal energy was supplied for both the SiNx layer and Al-Si electrode lines within the furnace to induce the interfacial bonding through the solid phase diffusion of Si. We printed a test pattern for the edge of the flexible PET substrate of 3cm*3cm size. Experimental conditions such as heating temperature, heating time were optimized to get enough adhesion strength which was estimated through the competitive bending test. Finally, OLED devices with flexible PET substrate of 3cm*3cm size were manufactured to investigate the blocking characteristics as an encapsulation layer.

Keywords : barrier, encapsulation, OLED, solid phase diffusion
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