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The LMPA/Epoxy Mixture Encapsulation of OLED on Polyimide Substrate

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Abstract : The organic light emitting diode(OLED), is a potential organic optical functional materials which is considered as the next generation display technology with the advantages such as all-solid state, ultra-thin thickness, active luminous and flexibility. Due to the development of polymer-inorganic substrate, it becomes possible to achieve the flexible OLED display. However the organic light-emitting material is very sensitive to the oxygen and water vapor, and the encapsulation requires water vapor transmission rate(WVTR) and oxygen transmission rate(OTR) as lower as 10-6 g/(m2.d) and 10-5 cm3/(m2.d) respectively. In current situation, the rigorous WVTR and OTR have restricted the application of the OLED display. Traditional epoxy/getter or glass frit approaches, which have been widely applied on glass-substrate-based devices, are not suitable for transparent flexible organic devices, and mechanically flexible thin-film approaches are required. To ensure the OLED's lifetime, the encapsulation material of the OLED package is very important. In this paper, a low melting point alloy(LMPA)-epoxy mixture in the encapsulation process is introduced. There will be a phase separation when the mixture is heated to the melting of LMPA and the formation of the double line structure between two substrates: the alloy barrier has extremely low WVTR and OTR and the epoxy fills the potential tiny cracks. In our experiment, the PI film is chosen as a flexible transparent substrate, and Mo and Cu are deposited on the PI film successively. Then the two metal layers are photolithographied to the sealing pattern line. The Mo is a transition layer between the PI film and Cu, at the same time, the Cu has a good wettability with the LMPA(Sn-58Bi). At last, pattern is printed with LMPA layer and applied voltage, the gathering Joule heat melt the LMPA and form the double line structure and the OLED package is sealed in the same time. In this research, the double-line encapsulating structure of LMPA and epoxy on the PI film is manufactured for the flexible OLED encapsulation, and in this process it is investigated whether the encapsulation satisfies the requirement of WVTR and OTR for the flexible OLED.

Keywords : encapsulation, flexible, low melting point alloy, OLED
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