

Buckling of Thin Films Constituting Organic Light Emitting Diodes

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This paper describes an evaluation method of the mechanical properties and electrical characteristic of thin films constituting organic semiconductor, and the test result of the relation between buckling, cracking and the electrical resistance of the films. The final target of the present research is the improvement of flexibility of organic devices, flexible displays and flexible organic light emitting diodes (OLEDs). The purpose of this study is to understand the vulnerable parts of the constituent materials of OLED quantitatively, further the guideline for designing OLED structure will be obtained. A three-layer thin film structures PEN/PEDOT/Alq₃/Al, and PEN/PEDOT/CBP/Al were prepared by spin coating and vacuum deposition methods. Then electrical resistance and buckling of the films were investigated by using bending test. As a result, it was found that delamination was observed on the surfaces of the multi-layer structures. After the observation of the cross section using SEM, the delamination were occurred at the interface between metal and the under layer. It has been suggested that the delamination is a buckling caused by the top metal layer which has high elastic modulus. The phenomena was simulated by a structural analysis using finite element method.