Moisture-barrier property of nanolaminate-multilayer structures for thin-film encapsulation of flexible OLED lightings

서승우, 정 은, 임찬규, 조성민*
성균관대학교
(smcho@skku.edu*)

We present a hybrid organic-inorganic multilayer moisture barrier with a very low water vapor transmission rate (WVTR) less than 10^{-6} g•m^2/day. The organic layer is an optimized Al_2O_3/ZrO_2 nanolaminate and the inorganic layer is a plasma polymer synthesized with hexamethyldisiloxane (HMDSO) vapor in a vacuum chamber. It has been known that the nanolaminates of Al_2O_3 and ZrO_2 show much higher moisture permeation resistance than the single oxide layers. For the organic layer, HMDSO-based plasma-polymer layers are synthesized on the nanolaminate surface with various thicknesses. The effect of the polymer thickness on the bending property of flexible OLEDs will be discussed in this presentation. There are a number of advantages of the HMDSO-based plasma polymer, which are the high growth rate, the very low surface roughness, and the compatibility to the oxide nanolaminate. For the precise measurement of the WVTR, we have utilized the electrical Ca test. All the Ca test measurements have been carried out in the temperature of 85°C and the relative humidity of 85% for the accelerated tests.