Surface and interfacial morphology and crystallization in polymer light emitting devices

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Recent advances in the development of polymer light emitting devices have led to the realization of devices with high operational stability, reflected in the device half-life time amounting to many thousands of hours [1.2]. Polymers light emitting devices enable full spectrum color displays and are relatively inexpensive compared to OLEDs and require little power to emit a substantial amount of light. Organic materials are more susceptible to chemical degradation from e.g. oxygen, nitrogen and water than inorganic materials. There is a rough division between chemical and physical degradation studies. Organic materials and metal electrode materials such as aluminum are susceptible to reactions with oxygen and water. There are subsections on the photo-degradation of polymers, on polymers with oxides composites and on degradation at the ITO and metal electrodes. A number of studies have been carried out and they showed that the stability and degradation issues are rather complicated and certainly not yet fully understood through the progress has been made.

In this work, we investigate the thermal degradation effect of surface and interfaces in PLEDs as a function of annealing temperature by X-ray reflectivity and transverse diffuse scattering. The techniques measure the thicknesses, roughnesses and electron densities of the layers in devices. Temperature dependence of crystallization of polymers was studied by grazing incidence wide angle x-ray scattering measurement. The results will be discussed further in detail.

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