

Enhancement of optical, thermal, and mechanical properties of PC-based nanocomposite diffusers for LED backlight unit using montmorillonite nanoplatelets

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For the application of direct-lit LED backlight units, polycarbonate (PC)-based nanocomposite optical diffusers containing silicone bead as a basic diffusing agent were prepared using twin-extrusion compounding process. In order to enhance the optical and physical properties of the diffusers, organically modified montmorillonite (MMT) nanoplatelets were employed as reinforcements as well as co-diffusing agents. We investigated nanostructured morphology of the prepared nanocomposites by both XRD analysis and TEM observation. The incorporation with low level of clay loading resulted in substantial improvement in the thermal and mechanical properties. The luminance uniformity with respect to both location and viewing angle was also shown to be slightly enhanced upon addition of MMT. In addition, we examined the effect of nanoclay inclusion on the moisture permeation resistance property of the nanocomposite diffusers to present practical guideline for the purpose of avoiding warpage phenomena, which might be induced by high heat energy from LED chips .