New Diffuser Film Using Coating Technology for LCD Backlight

Hee Nam Hwang, Woong Hyun Choi, Ki Ho Lee, Insun Kim,
R & D Institute, i-Components Co., Ltd., Choopal Industrial Zone, Pyungtaek, Kyonggi, Korea

Abstract

New diffuser film for LCD backlight is developed. A diffuser film was manufactured through coating UV curable monomer on a plastic film. The diffuser layer coated on plastic film showed excellent optical transmittance.

Introduction

A diffuser film has various applications include LCD monitors, television screens, PDAs, GPS navigation units, cell phones, automobile LCDs, cameras and portable DVDs.

In the LCD backlight, the diffuser films have been manufactured by coating micro-sized polymer bead on polyethylene terephthalate (PET) films. These types of diffuser have inferior optical transmittance and cannot control diffusive direction in the diffuser film because of utilizing scattering of incident light.

We focused the increase of optical transmittance and the control of diffusing direction in this work. In order to increase optical transmittance, we developed new method of diffusing without scattering of light. And we could control direction of diffusing through reforming of diffusing layer.

Results & Discussion

We produced the PC film having superior optical properties such as transmittance and retardation. The transmittance is 90% at 550 nm and the optical retardation is below 10 nm in PC film.

The diffuser film was manufactured through coating UV curable monomer on the PC or PET film. Diffusing layer coated has semi-crystalline structure in micro size. When light enters diffusing layer, it travels through boundary of semi-crystalline region. As a result, the light became diffused inside of diffusing layer. The diffusing layer with semi-crystalline structure minimized scattering of light and irregular reflection therefore has excellent optical transmittance.

The diffusing direction depends on the anisotropy of diffusing layer that was controlled with coating condition such as the thickness of diffusing layer and pretreatment of substrate.

The diffuser film developed have optical transmittance above 80% (@550nm)(Figure 1). According to change thickness of diffusing layer, the haze was controlled with ease(Table 1).

Thickness of diffusing layer (μm)	Transmittance (%, @550nm)	Haze (%)
10.2	79.01	81.78
6.5	80.5	76.93
5.5	81.67	76.28
4.3	80.1	74.52
3.5	81.4	72.66

Table 1. The optical properties of diffusing layer on PC film

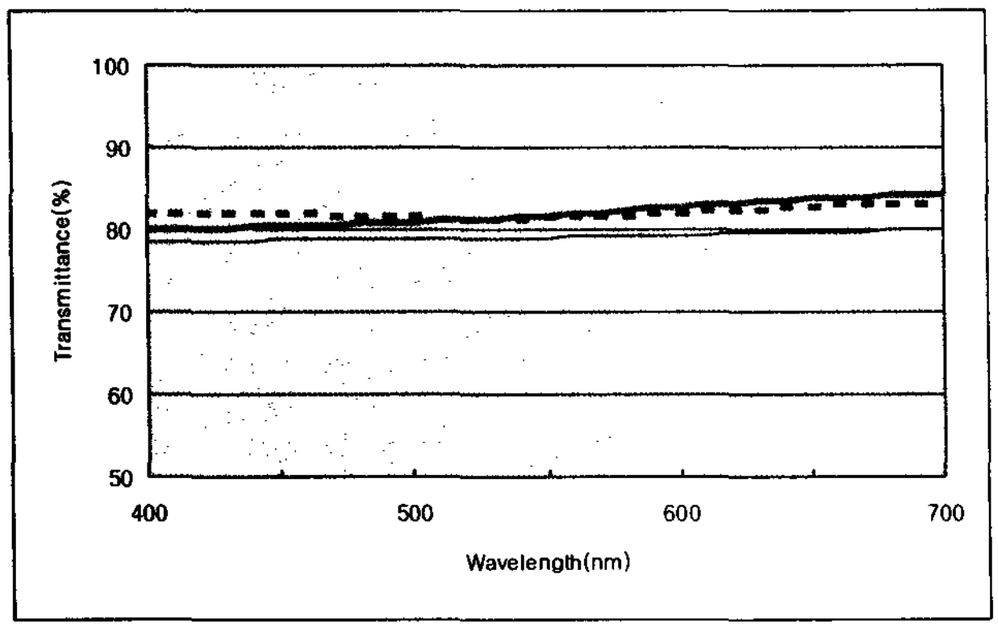

Figure 1. The transmittance spectrum of diffuser films

[thickness of diffusion layer: 3.5μm(dotted), 5.5μm(bold),: 10.2μm(normal)]

Conclusion

The market of diffuser film has been growing in advanced electronics and other LCD applications. We expect that new diffuser film can increase efficiency of a backlight unit.

References

1. L. M. Murillo-Mora et al, "Directional Diffuser", IDW'03, pp701

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