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Abstract
In this work, the optical phenomenon of bright and dark fringes near the incidence surface of a wedge-type light-guide plate (LGP) in a backlight module is studied. It occurs when a cold cathode fluorescent lamp (CCFL) is used as a light source. Optical simulations using Advanced Systems Analysis Program (ASAP) are implemented to investigate and analyze the cause of bright and dark fringes. A set of solutions are proposed for fringes elimination.
In the first part of this study, a series of step-by-step optical simulations are performed to identify the causes of bright and dark fringes in backlight module by examining the influence of LGP, lamp reflector, and reflection film. As simulation results reveal that the occurrence of bright and dark fringes is due to the lamp assembly of a backlight module does not completely block out the light entering into the gap region between the up (bottom) surface and lamp reflector (reflection film).
The second portion of this study is focused on the solution of bright and dark fringes problem of a backlight module. There are two approaches for the resolution of the above mentioned problem, either by mechanism or by optics. The first approach is implemented by disposing an absorbing component on the region of the surface of the lamp reflector which is directly located beneath or above the LGP. The second approach can be realized by introducing microstructures on the incidence plane of a LGP that is the focus of this work. Both V-groove and U-groove microstructures are investigated; the effects of both degree of irregularity of groove alignment and surface roughness of are examined.
The simulation results from this study indicate that an irregular aligned U-groove or V-groove microstructure on the incidence plane of a LGP can make the bright and dark fringes indistinguishable. And a gradually deepened longitudinal V-groove on the bottom surface of a LGP can also attain fringe elimination. In addition, the work of microstructure on incidence plane of a LGP can also serve as a foundation for the development of “no optical films backlight”.
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