

Free-form lens design for LED indoor illumination

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Abstract

This paper presents a free-form lens design for indoor illumination. The lens consists of a TIR (total internal reflection) surface on the sidewall, a refractive surface on the front side, and a concave surface on the rear side. The TIR surface is decorated with a free-form profile that light rays emitted from the LED with a larger spread angle to the axis will experience a total internal reflection and output from the front refractive surface. While the central part of the front refractive surface has a convex surface that makes light rays closing to the optical axis more evenly distributed. The purpose of the rear concave surface is to let light rays emitted from the LED enter the lens straightforwardly. With this lens light rays from a Lambertian-type LED light source can be redistributed so that a uniform illumination can be achieved. The optical simulation results show that the measured optical efficiency is 75% while the uniformity is 80% on a target plane of 6-m diameter and at 2.5-m away.

Key words : LED;Free-form;Uniformity