Flashlight end caps

One of the benefits of using SILASTIC™ Moldable Optical Silicones is the ability to reproduce fine detail from the molds. There are many optical reasons for adding texture to a component, and there are a wide variety of surface finishes or textures that are available from different companies that can be incorporated in a part. Texture is often used simply to improve the tactile feel of a part, or to increase moldability, by having the part remain selectively on one side of the mold. For our discussion, we are more concerned with the way surface finish can affect light transmission through the piece.

Patterns provided by LumenFlow Corp. and Holo-Source.

The first end cap above (Figure 1) is highly polished. Light transmission losses through this cover cap are mainly due to surface reflection effects on each side of the part.

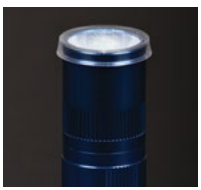

Figure 1

Figure 2

Figure 3

Figure 4

The next cap (Figure 2) has been surface blasted with 3 mil glass beads. This process produces a matte surface that provides diffusion of the light with only a small amount of transmission loss.

The third end cap (Figure 3) reproduces chemically etched square grid diffusion type structures. This process and corresponding surface produces a similar diffusion of light as compared to the bead-blasted surface. The structures are about 75 microns (0.003”) deep.

The fourth end cap (Figure 4) is a somewhat more complicated surface. The pattern placed in the mold is a set of flakes or chips which have grooves across each of them.

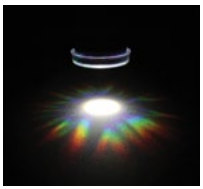

Figure 5

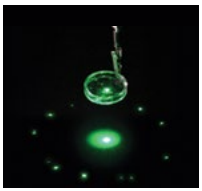

Figure 6

These grooves are 0.5-0.8 microns deep and 2-4 microns apart. (At 2 micron spacing this provides 12,700 grooves/inch or 500 grooves/mm.) This fine pattern acts as a diffraction grating. It splits (diffracts) the light into a series of rainbow spikes around the center beam when placed over the collimator lenses on the flashlight (Figure 5). The splitting effect can also be seen by shining a laser pointer through the cap. A circle of smaller dots will appear around the center main beam (Figure 6).

Care should be taken to keep the inside patterned surface of this cover clean. Oil from fingerprints can fill the fine grooves, negating the diffraction effect. Should this occur, the part can be easily cleaned with soap and water or eyeglass cleaner, etc. Upon drying, the diffraction effect will return.

Points to note:

- These end caps snap over the end of the flashlight hoods using a bead on the inside for tension.
- Place the end caps over the end of the flashlight and observe the change in output on a surface using the various end caps.
- Use the diffraction grating over the collimator to produce the rainbow spikes effect.
- All end caps can be cleaned if they become fouled from repeated handling.

Learn more

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