Application note

Optical properties of radiation resistant silicone

OPTICAL PROPERTIES OF RADIATION RESISTANT SILICONE

Silicones are comprised of molecules with a repeating backbone of siloxane units (Si-0) with at least one carbon – silicon bond. The chemical and physical properties of the silicone can be optimized by adjusting the concentration and type of organic group attached to the silicon. The methyl group ($-CH_3$), which forms polydimethylsiloxanes (PDMS), has a long history in several applications from industrial to use in space and healthcare applications. The chemical nature of PDMS has specific optical properties as well. The refractive index is typically 1.40 -1.41 at 589 nm and can have excellent optical transparency in the visible spectrum. Due to the organic nature of silicones, they will also absorb in the near IR and IR regions. See the graph below for a typical absorption spectrum of a 1.41 silicone encapsulant.

These tests may not be performed on a lot to lot basis in the future and are not intended for use as specifications. The material chosen for this test was determined to be representative of the typical procedures and properties of this product.

OPTICAL PROPERTIES OF SILICONE BEFORE AND AFTER UV AND HEAT EXPOSURE:

Silicones do not degrade at continuous high operating conditions up to 200 °C. They are also able to maintain their flexibility at temperatures as low as - 60 °C compared with other adhesives that have Tg above 0 °C. Silicones can have excellent optical stability after heat and UV exposure. See the graphs below showing the optical transmission over time after heat and UV exposure of a 1.41 refractive index silicone.

UV Exposure Testing Conditions

- Radiation exposure is 190 mW/cm^2
- 680 J/cm^2 total radiation
- Temperature in chamber 75-90°C

Optical transmission of a 1.41 RI heat resistant silicone after > 600 hrs at 150°C

Optical transmission of a 1.41 RI silicone after exposure to UV radiation for 1000 hrs

The data represented is from a limited sample population and is qualitative only. The batch tested was determined to represent the typical procedures and properties of this product. These tests are not performed on a lot to lot basis and are not intended to be used as specifications.

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