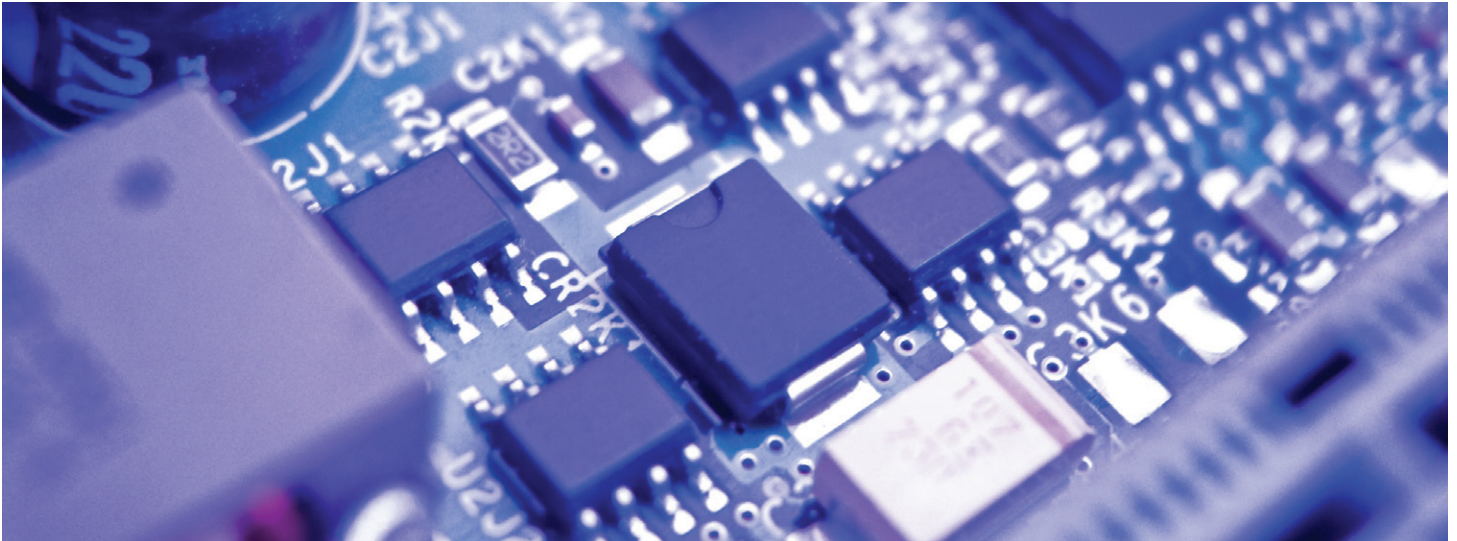


# UV Products Application Guide

**NOVAGARD®**  
PERFORMANCE SILICONES



Building on our decades of UV expertise, Novagard is the clear market leader in UV/dual cure silicone technology for the protection of electronic devices and component assemblies.

Novagard products offer formulations from 700 cPs to 360,000 cPs, ensuring optimal performance for every application from easy spray coatings to highly controlled gap filling and encapsulation. Novagard UV Cure and UV/dual cure materials are premixed and arrive ready to use.

**UV Cure Silicone** hardens completely in less than 5 seconds, making it ideal for deep section applications up to 0.75" (20 mm), enabling immediate processing and packaging.

**UV/Moisture Dual Cure Silicone** cures exposed areas in 5 seconds for immediate handling, while the shadowed areas continue to cure for 7 days to develop full adhesion through a secondary alkoxy moisture cure.

## Key Features

- Processing Speed Increases Throughput
- Strong Dielectric Properties
- Specifications: UL 94, UL 746E & ISO 10993
- Multiple Viscosity Grades
- Several Cure Options
- Solvent Free, PFAS Free

## Curing Requirements

### BROAD SPECTRUM

Wavelength: 200 – 405 nm (UVA, UVB & UVC)

Dosage: 1,000 mJ/cm<sup>2</sup>

### LED SYSTEM

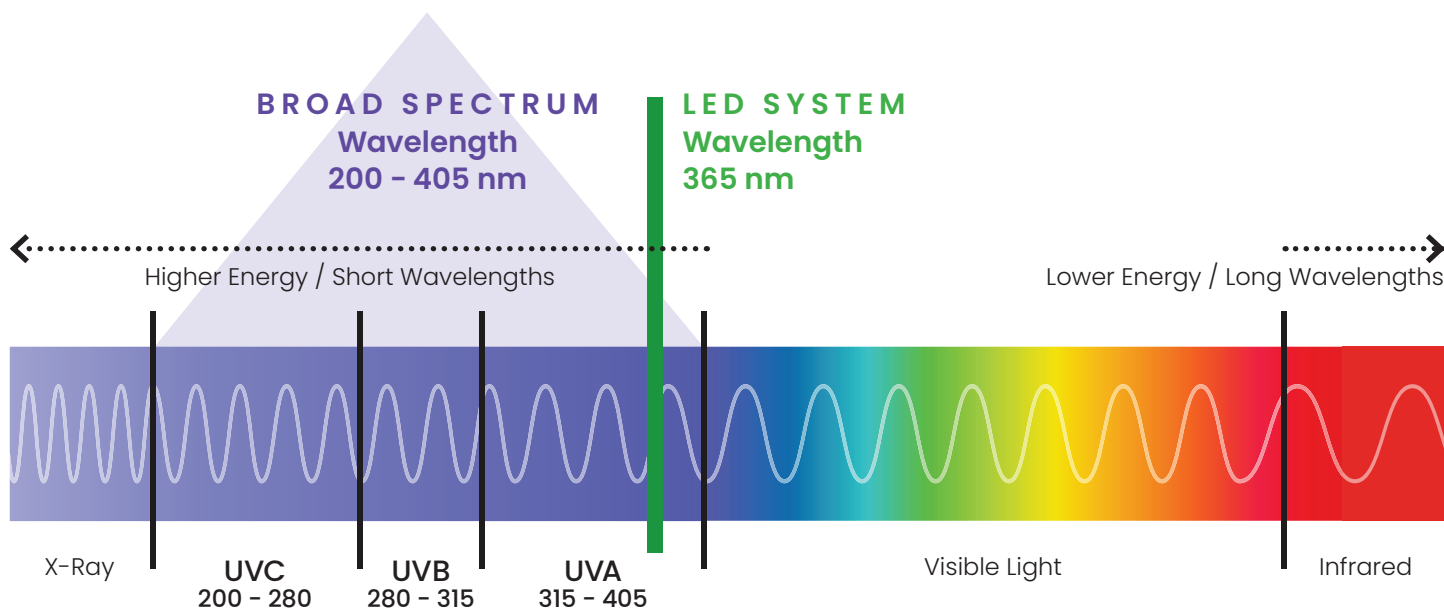
Wavelength: 365 nm (UVA)

Dosage: 4,000 mJ/cm<sup>2</sup>

# Ultraviolet Light Curing for Coatings, Adhesives & Sealants

Ultraviolet (UV) light curing uses high intensity UV light to initiate rapid curing reactions in liquid formulations such as coatings, adhesives, and sealants. The chemical reaction utilizes photoinitiators within the formulations which, when exposed to the proper dosage of UV light, generate free radicals. These radicals initiate the polymerization of monomers and oligomers to create a solid polymer structure within seconds. UV cure chemistry ensures consistent curing, efficient processing, increased speed, and higher throughput leading to reduced total manufacturing costs. The user's ability to control UV irradiance enables a tailored curing process.

UV energy produced by broad spectrum and UV LED lamps consists of photons at specific wavelengths that are critical for UV photopolymerization. Broad spectrum lamps emit a wide range of photon wavelengths, including UVA, UVB, and UVC. These lamps create a thorough cure, but are less energy efficient than LED lamps. UV LED lamps emit photons within a narrower wavelength, primarily in the UVA range. These LED lamps do not require warm up, are energy efficient, and produce less harmful irradiance than broad spectrum lamps.



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# UV Curing Terminology

## Dwell Time (seconds)

Total time the substrate is exposed to UV energy, influenced by belt speed and emitting window size of the lamp.

## Area (cm<sup>2</sup>)

The total two dimensional space exposed to UV light. The size of the lamp's beam determines the area's calculation.

## Irradiance (W/cm<sup>2</sup> or mW/cm<sup>2</sup>)

Radiant power arriving at the substrate's surface per unit area, typically quoted at peak irradiance.

## UV Power (w)

Total power output by a UV light source, measured in watts.

## Radiant Energy Density (Dose)

(J/cm<sup>2</sup> or mJ/cm<sup>2</sup>)

Energy arriving at the substrate's surface per unit area during a specific dwell time, calculated as irradiance multiplied by dwell time.

## Light Source (Lamp)

Unit housing a broad spectrum or LED source that emits UV energy.

## Wavelength (nm)

Spectral output of UV source, measured in nanometers, determining the range of wavelengths for UV power emission.

## Material

Substance cured by UV energy, comprised of photoinitiator, oligomer, monomer, and additives.

## Substrate

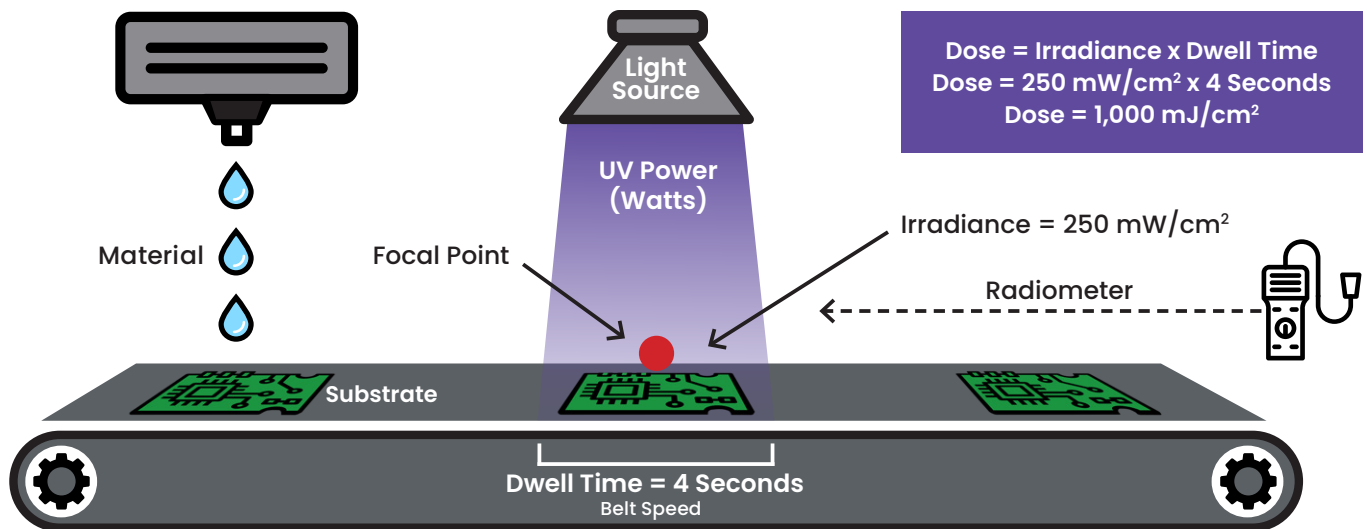
Physical material onto which cured adhesive, coating, or sealant is applied. Substrate examples: plastics, FR4, glass, aluminum, and stainless steel.

## Focal Point

Location of concentrated energy where irradiance is greatest.

## Radiometer (mJ/cm<sup>2</sup> or mW/cm<sup>2</sup>)

Device used to measure the dosage and irradiance level under UV lamp curing system.



## Application Technology & Lamp Recommendations

**Conveyor System:** A moving belt passes through a chamber equipped with a broad spectrum or LED lamp positioned above the belt. The chamber includes mirrors to increase the number of focal points during the dwell time. These systems offer adjustable line speed, lamp height, and stable lamp irradiance, ensuring reliable light curing for consistent processing and high throughput.

**Flood Systems:** Substrate and material are placed in a chamber below the broad spectrum or LED lamp. The system floods the enclosed space with UV light for a set dwell time. Flood systems ensure intense and direct irradiance, allowing a customizable cure. These are good for lower throughput processes that require higher dosages.

**Spot Cure:** UV light wands are maneuvered to apply UV light to specific substrate locations. These lamps provide intense UV radiation to targeted focused areas of the substrate, where accuracy and speed are production parameters.

# Helpful tips when curing

A S S E M B L I N G | C O A T I N G | P R O T E C T I N G

## Product

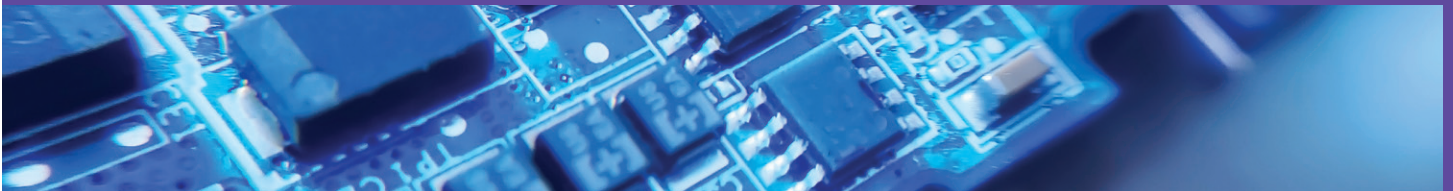
- Different application thicknesses may require different dosage levels.
- A yellow tint may appear in UV/dual cure products for 6-8 hours after curing, but will fade to the final specified color within 24 hours.
- The material may be slightly tacky or oily for 4-24 hours post-cure, depending on curing conditions.

## Production/Lamp Implementation

- UV lamp irradiance can be estimated using bulb wattage, wavelength, and lamp exposure area. For precise measurement, use a radiometer. Lamp irradiance can only be adjusted on LED lamps.
- Speed, height, and time can be adjusted to provide the required dosage.  
 $\text{Dosage (mJ/cm}^2\text{)} = \text{Irradiance (mW/cm}^2\text{)} \times \text{Dwell Time (seconds)}$
- UV bulbs can lose intensity over time, which reduces the irradiance level directed to substrate.
- Overcured material may appear dark yellow and emit a burnt odor. Do not expose material to >5x the recommended dosage.

## Novagard Services

- Application review and material recommendation.
- Expert broad spectrum and LED 365 nm curing assistance.
- UV lamp loaner program: enables on-site trials and demos
- Collaboration with lamp manufacturing partners to identify the right lamp system for your production needs.



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