

# Curing and Bonding

Plastic clothespins left outside can become brittle and easy to break. Most people have experienced this. This is a result of the plastic being exposed to the ultraviolet (UV) rays of the sun. Using the chemical energy of ultraviolet light, it is possible to change substances at the molecular level and join them together. That is the power of UV curing and bonding technology.



## Light x curable resin = Curing and bonding

UV curing is what takes place when a specially formulated light-curable resin (photocurable resin) is irradiated with ultraviolet light at a wavelength of 200 to 400 nm (nanometers). The history of UV curing is quite extensive, going back to the 1970s when it was developed as a printing technology capable of speeding the drying of ink on materials such as metal and plastic. The technology made it possible to obtain good printing results on such surfaces by mixing ink with photocurable resin and irradiating the surface immediately after printing to instantly harden the ink.

Use subsequently spread to curing of paint and application of protective coatings to surfaces, and now UV curing technology is used to join together the delicate miniature components of devices that are not amenable to screw fastenings, such as televisions and Smartphones, as well as joining elements that require high light transmissivity, such as camera lenses.

## Light = Glue?!

Today, in order to further reduce the size of components, even the microns-thick application of curable resin has been eliminated, as VUV joining technology is used to bond components of different composition together directly. This process irradiates substances with 172-nm vacuum ultraviolet (VUV) to activate their surfaces and combine what were formerly objects of different composition into a single substance. Truly, light is glue.

This technology not only facilitates the miniaturization of objects, but also eliminates worries about joined objects becoming separated — a particular concern with embedded medical devices — as well as concerns about gasification of resin bonding agents.

Joining objects together: It is a task that looks simple, but it is the optical technologies of UV curing and VUV bonding that are essential to the further development of electronic products.



**Ultraviolet instant curing equipment UNICURE system**  
Main applications: LCD panels, touch panels, electronic components, printing, etc.



**LCD panel bonding system**  
Main applications: Joining of LCD panels used in devices such as televisions, Smartphones and tablet PCs

## “Curing and bonding with light” The Mechanism

Matter is composed of molecules consisting of linked atoms, such as oxygen and hydrogen, carbon and nitrogen, and ultraviolet light is capable of breaking the bonds between such linked atoms. The bonds of molecules in photocurable resin are also broken by ultraviolet light, and the smaller molecules that result seek out others with which to bond, resulting in molecules that are larger. (This process is referred to as a photopolymerization reaction.) As a result, the structure of matter is altered (to high-molecular compounds) and its color and hardness changes.

