CTECH LLC

Chemical and Equipment Solutions for the Specialty Coatings & Adhesives Industry

Disk Drive, Electronic and Optical Grade UV Epoxy Adhesives. Optimized for "Delay Cure" Processing

Product Data Sheet

Product Description: CTECH™ 11-225-4A and 11-226-1&2 are high and low modulus variants, respectively, of UV curable adhesives that bond well to many substrates such as glass, ceramic, metal and plastics. These materials are UV curable with moderate cure speeds when exposed through clear bondlines or as encapsulants or in potting applications.

CTECH™ 11-225-4A and 11-226-1&2 can also be utilized in a "delay cure" mode. Here material is applied to one surface, exposed to UV light briefly, which begins the curing process but allows a "delay" for assembly. The cure will then continue to fixture the assembly. Advantages of the delay cure process are that light can be used as an activator or in place of two part systems to bond opaque substrates.

The product is inherently low in ionics and outgassing after cure, and is therefore suitable for applications on or near sensitive components. Electrically and thermally conductive versions of this product are also available as well as other viscosities and visible light and heat cure capability.

Typical Physical Properties.

Uncured Material.

Color: Hazy to clear liquids. % Non-Volatile Material: 99^{+} %

Viscosity, Nominal values: CTECH™ 11-225-4A 700 cps
CTECH™ 11-226-1. 791 cps. CTECH™ 11-226-2. 6500 cps.

Flash Point: > 212^{o} F. Solubility: Ketones, alcohols

Shelf Life: 1 year at ambient

Cured Material.

Durometer: D81 for the 225-4A product and D45 for the 226 Series cured with 3 J/cm^2 .

Cure Times. UV Mode: Fillet areas and coatings cure tack free within seconds and through volume with 2-6 J/cm^2 of exposure. This can range from 15-30 seconds depending on the type of lamp used.

Cure Times. Delay Cure Process: A 3 mil film of product on a steel lap exposed to 300 mJ/cm^2 will allow an open or "delay" time of 10 seconds in which to assemble and clamp another lap on top. The two laps will be "fixtured" , bonded to firm hand pressure, within 45 seconds.

Structural Properties: Delay Cure Mode; 24 hour test. The 11-225-4A will develop about 200 psi tensile strength on stainless steel laps and 1.95 in-lbs of impact resistance.

Water Absorption, 1x1.5 cm plug: The 11-225-4A after 4 days 24 hr. at ambient soak gains 1.8% by weight.

Total Material Loss; Outgassing Results:
Delay Cure Mode: CTECH 11-225-4A at 3 mil thick by 4 cm diameter was exposed to 300 mJ/cm^2 and aged 24 hours at ambient. The cured film was tared and then put in to an 80^{o} C oven. The sample lost 0.74% by weight after 4 hours bake and an additional 0.04% after another 7 hours.

UV Cure Mode: CTECH 11-225-4A at about 1 mm thick by 4 cm diameter was exposed to 3,000 mJ/cm^2 and aged 24 hours at ambient. The puck was tared and then put in to an 80^o C oven. The sample lost 0.27% by weight after 4 hours bake and an additional 0.04% after another 7 hours.

Processing. 11-225-4A and 11-226-1&2can dispensed from syringes or automated systems followed by component placement or assembly. Exposure to an UV light dose of 2 J/cm^2 will harden the bondline enough to allow further processing of the assembly. It is suggested that relatively high exposures are tested first, e.g. 4 J/cm^2, and then much lower doses compared with those results. For difficult surfaces such as nickel plate, a 100-110^{o}C postbake for 30-60 minutes produces a substantially stronger bond. Other surfaces may not require a postbake, given adequate UV exposure. Alternatively much lower UV doses can be used if a postbake process is acceptable.

In general structural bonds would use the lower durometer products and applications that use the adhesive to fixture or pot components would use the higher durometer products.

For a delay cure process the exposure dose used is about 1/10 the amount for full cure. For example, 2-5 seconds exposure at 100 mJ/cm^2 will allow 15-45 seconds delay for assembly to take place with a subsequent fixturing time of 30-60 seconds. At this point, using stainless steel laps, 2-10 pounds of tensile force are achieved. Clamping of the assembly during the fixture time should be employed if possible. As with other UV epoxies the cure process will continue and ultimately produce very high structural adhesion. The delay cure process can achieve final properties quicker with a post-UV bake even as low as 65^o C for one hour.

One advantage of the delay cure process is that inexpensive lamps may be used to produce results equal or better than conventional UV cure systems. For example these products, when exposed for 5-7 seconds at a distance of 3 inches from the CTECH™ CT-100NF mercury flood lamp [50 mJ/cm^2], allow a delay of 30 seconds for assembly and then give a firm fixture on steel, glass or plastic after an additional 30 seconds. Variations of the exposure dose inversely control the delay period which itself inversely controls the fixture time. There is no mandatory open or delay period needed for the chemistry so assembly can always take place before the stated delay time. Obviously some experimentation is needed to optimize the process for each application. One should find the maximum exposure dose first, which is when the film or bead hardens before assembly can take place. The minimum exposure dose can be determined when the final fixture time extends past several minutes, or is not well defined, e.g. the parts can still be moved with hand pressure even though adhesive strength is building.

Lamps which output wavelengths of 200 nm. - 400 nm. will cure more quickly than those with the shorter wavelengths filtered. For thick sections of the adhesive, longer wavelengths, which penetrate further, will often give more complete cure and less coloration than the high intensity lamps. Actual cure times will depend on required depth needed and intensity of light used. For very thick sections exposure doses up to several joules/cm^2 may be required.

Immediate de-fixturing and movement of parts is possible, however **physical properties, especially adhesion, will continue to develop over 2-24 hours after UV exposure**. Post UV heating can be very effective in bringing the product to its optimum properties. Even 30-60 minutes at 100˚ C will produce equivalent or better results than 24 hours at ambient. Higher temperatures can be used, and for applications that will run at higher temperatures, it is recommended that a postbake be performed, at those values. High ambient relative humidity (>65%) can also effect cure parameters. If noticeably softer coatings result during these conditions, a longer UV exposure, preheat of substrate and/or postbake should eliminate any problems.

The information presented here is to the best of our knowledge, reliable. Suggestions made concerning use and applicability are for instructional purposes only, and users should make their own tests to determine the suitability of the product for their own purposes. Because of numerous factors affecting results, CTECH LLC makes no warranty of any kind, including fitness for purpose.