



"An ISO 9001 registered company"

TSR # 9

Issue date: 03/01

Ultraviolet Light Cured EPOXIES vs. Acrylic Based Systems

UV curable epoxies are very unique materials utilizing specialized oligomers and polymers to create fast curing, chemically resistant, highly versatile one component adhesives. These epoxies are not like traditional two component or one component heat cure systems, they have a curing mechanism unlike any other adhesive on the market. This cationic mechanism cures through the epoxy functional group while acrylics cure through a free radical mechanism.

One of the major differences in these two cure mechanisms is that the epoxy continues to cure after the UV light has been removed. This is called the "dark cure" phenomenon. The cationic epoxy reaction is initiated by the UV light and continues to react as much as it can within the matrix until all reactive functional groups are used up. Acrylics on the other hand, only react while they are exposed to UV light. This means if the light is on for a short period of time, the adhesive may not be fully cured while short exposure for a cationic epoxy is only the beginning of the reaction.

The epoxy reaction continues as far as it can at room temperature and then stops. Moderate heat can push the reaction to completion. EMI recommends a short post heat cure from 40°C to 150°C for 60 minutes to 3 minutes. It is very important to allow these materials to fully cure before testing for ultimate properties. EMI recommends a 24 hour wait before performing physical testing. Parts can be further processed right away as the epoxy is set, but it is important to keep in mind it may not be fully cured.

A few more important differences between UV epoxy and UV acrylic are;

- Epoxies are all one component.
- Epoxies have no odor.
- Epoxies all cure in safer, long wavelength UV 320-380nm.
- Epoxies are not inhibited by air when curing, therefore, no sticky surface.
- Epoxies shrink less than 1% with some formulations as low as 0.25% or less.
- Acrylics can shrink anywhere from 2% to 5%.

EMI epoxy formulations are available in a range of hardness and viscosity, Tg and CTE. Custom formulation is available when necessary.

The table below summarizes the differences between UV epoxy and UV acrylic.

Epoxy	Property	Acrylic
None	Odor	Moderate- High
Excellent	Chemical Resistance	Good
Excellent	Solvent Resistance	Fair to Good
Very High	Tensile Strength	Lower
Very High	Tensile Shear	Lower
Very High	Heat Resistance	Lower
Can be up to 220°C	Tg	Can be up to 125°C
12 months	Shelf life at 25°F	12 months
Yes	Dark Cure	No
No	Air Inhibition	Yes
Negligible	Shrinkage	High up to 5%
Very Low	Outgassing	Much Higher

Rev.001

End of Document