Why Select an Epoxy Adhesive?

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When considering the effectiveness of an epoxy adhesive, it is useful to analyze the general formulation of the compounds that constitute it. Epoxies are created by polymerizing a mixture of two starting compounds, the resin and the hardener. When resin is mixed with a specified catalyst, curing is initiated.

Curing is the process by which molecular chains react at chemically active sites, resulting in an exothermic reaction. Covalent bonds between the epoxide groups of the resin and the amine groups of the hardener (catalyst) that arise from this combination afford for the cross-linkage of the polymer, and thereby dictate the rigidity and strength of the epoxy.

Monitoring curing conditions by temperature and choice of resin and hardener compounds allow for alteration of mechanical strength properties, along with thermal, electrical and chemical resistance. Epoxy adhesives have therefore been developed to suit a wide array of applications and operating conditions.

Epoxy adhesives adhere to a variety of materials, and their properties are dependent upon the specific chemistry of the system and the nature of the cross-linking available. Some of the most important performance requirements include exceptional chemical and heat resistance, excellent adhesion and water resistance, as well as satisfactory mechanical and electrical insulating properties.

As the most widely used structural type adhesive, epoxy adhesives are commonly

offered as either one-component or two-component systems. One-part systems are formulated to be “pre-catalyzed,” and require only moderate heat to cure, improving efficiency and avoiding error that may result from air entrapment.

One-component epoxy adhesives are generally cured at temperatures between 250° and 300°F. These conditions produce a product of high strength, excellent adhesion to metals, and outstanding environmental and harsh chemical resistance. In fact, this product is often used as an alternative to welding and rivets. Furthermore, the speed of cure is rapid — faster than two-component systems.

Two-component epoxies differ in that catalyzation occurs at ambient temperatures and can be accelerated by heat. Adding heat also promotes additional cross-linking, resulting in superior properties.

Two-component systems are suitable for bonding most surfaces. In addition, their powerful ability to withstand a constant weight or force over an extended period of time, as well as their superb resistance to physical and chemical influences, make two-component epoxies a highly stable product.

They are extremely versatile, and can be used for bonding, sealing, coating and encapsulating across many industries including — but not limited to — electronics, medical devices and aerospace. Special formulations are also flame retardant, cryogenically serviceable, fast curing and high temperature resistant, among many other properties.

For more information, please visit www.masterbond.com *[1].*

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