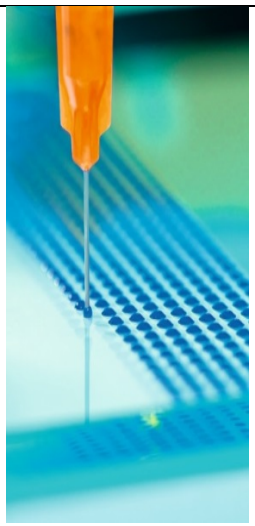
BASIC ADHESIVE TYPES

ADVANCED TECHNOLOGY FOR RESEARCH & INDUSTRY

KNOWLEDGE BASE FACT SHEET

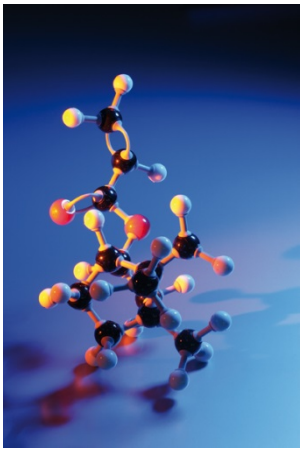
- SCOPE: A simple guide to the different adhesive types used in engineering and electronics today.



One-part Epoxies. Depending on the exact chemistry, a one-part epoxy will require a typical curing temperature of between 60 and 150°C. It may also require light curing, which is normally best done with high intensity UV lamps. One-part epoxies afford excellent chemical and moisture resistance. Other benefits include high thermal resistance (more than 200°C) and a high tensile strength (of up to 57MPa), and the higher the cure temperature the stronger the bond formed. As for drawbacks, even with the application of heat, cure times can be relatively long. Light curing is much quicker. Also, once cured, the bond is rigid. Regarding storage, the latest one-part epoxies to join the market require a temperature of less than 10°C and some can be as low as -40°C.

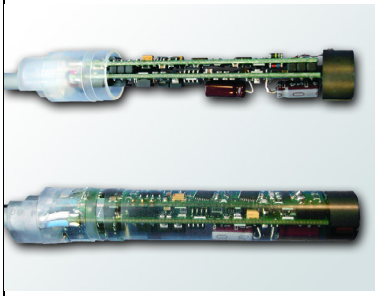
Two-part Epoxies. These offer bond strengths of up to about 28MPa, are relatively easy to process using a mixing system, have a shelf-life of up to about a year and can be stored at room temperature. In addition, once mixed, they cure at room temperature too. The application of heat can shorten the curing time and, as with one-part epoxies, the resultant bond is relatively inflexible.

Acrylates. Predominantly transparent, these are one-part adhesives and are cured using heat and/or light, have a shelf-life of between six months and a year and, once cured, exposed surfaces remain tacky. At about 30MPa, acrylates are more flexible than epoxies. Storage requirements will vary from 0°C to room temperature.



Two-part Polyurethanes. As with two-part epoxies, these are relatively easy to process, and curing can be accelerated with the application of heat. Shelf-life is about six months and, once cured, the tensile strength can be up to 23MPa. Perhaps the biggest drawback to polyurethanes is their low UV resistance (susceptibility to sunlight) and relatively low heat resistance, which tends to be limited to 125°C. This limitation also restricts the max heat curing temperature, capping it at about 80°C.

Anaerobics. These are one-part adhesives that afford a relatively high temperature resistance (up to about 200^{o}C) and tensile strength of about 15MPa. They cure in the absence of oxygen and the presence of a metal (though not all metals) and are frequently used for magnet bonding and thread-locking. Curing is at room temperature and, thanks to recent developments within the adhesives industry, any exposed adhesive (i.e. in contact with air) can be cured using UV light. Storage is at room temperature.



Silicones. Silicones are stored at room temperature, and cure at it too – though very slowly (typically at a rate of about 2mm per 24 hours). Once cured they remain very flexible and can tolerate up to 600% elongation in some cases. They have a very high temperature resistance (up to about 300^{o}C). On the downside, silicones outgas during curing and, post-cure, the resultant bond strength is not that great; at between 2 and 5MPa.

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PATH: Basic Adhesive Types
Website: https://www.inseto.co.uk/IKB041-adhesives-types.php