A
dhesive technology can be a cost-effective solution to connect
components for single use medical products. When bonding
transparent or translucent substrates, using a UV curing acrylate
adhesive has several advantages: They are easy to handle, can be quickly
dispensed and if necessary, can also cure in seconds. In addition cured
acrylates are compatible with common sterilisation processes such as
autoclaving, gamma and ETO. They maintain high adhesion after
sterilisation. Interestingly, in several tests electron beam sterilisation (not
in the diagram below) has even improved the adhesion.

By sterilising and good preparation, acrylates can achieve
significantly better bond strength

After curing, uv curing acrylate adhesives are very resistant to autoclave
sterilisation, gamma irradiation and ETO treatment. Usually there is no
reduction in bond strength at all. E-beam Sterilisation has proved to be
especially effective, and with some acrylates improvements can be
achieved, because of an increase in the degree of polymerisation of the
chemistry. This means that invisible bonding, transparent acrylates have
high strength, long lasting adhesion and good sealing properties, even
after several cycles of sterilisation.

Especially non-polar substrates, mostly plastics such as polyethylene or
polypropylene, and also steel, after a surface pre-treatment such as
Corona or Plasma will often achieve a better and lasting bond. With a few
acrylate adhesives you can achieve improvements in bond strength
through pre treating the substrates by up to 50% increase.

Typical examples for the use of UV curing acrylate adhesive are bonding
catheters, and lancets; also suction tubes, blood sugar metering or
medicine holders, bonding to larynx heads or blood pumps and
breathing masks.

Fast curing increases productivity

Acrylates are solvent-free, environmentally friendly and very well suited
for manual and automatic production processes for high volume
component manufacturing. As a single component system they are easy
to handle. In many cases they are cured with LED light devices and
wavelengths within visible light range - all within 10 seconds. The cold
LED technology is especially important for bonding temperature-
sensitive parts.

In principle, the curing time of an acrylate is between 0.5 and 60 seconds.
For example, during the bonding of needles in syringes, then curing is
significantly less than a second.

Despite a short cure time, a very high/ high mechanical strength is
achievable; it's worth noting the E-module. The E-module is a benchmark
for the inner strength (cohesion) of a material, however it is dependent
on the elasticity of the adhesive: the more elastic the adhesive and the
higher the elasticity, the lower the module. That is why low modules do
not necessarily mean poor mechanical properties.

Measuring the tensile bond strength under different climatic
conditions

The bond strength of the substrates was investigated by measuring the
tensile strength. Two flat samples were bonded to each other under
different climatic storage conditions and pulled apart to the point of
failure. The value of the required force is a measure of the adhesion of
the adhesive. After 24-hour storage of the specimen in isopropyl alcohol
or water, as well as under the influence of elevated temperature for a
long time and humidity, the results are compared with values of
unpolluted samples. In all cases there was no fall in bond strength or a
only very small decrease.

Acrylates are ideal for transparent or translucent substrates such as glass
and plastic, and are also ideal when bonding these substrates to metals.