

Soldering to Nitinol

Due to its shape memory characteristics, **Nitinol (nickel-titanium alloy)** has become an increasingly popular material in the medical industry, where it is often used in stents, catheters, and other implants. Medical device manufacturers often wish to mechanically bond Nitinol to another metallic material, such as stainless steel, using a solder alloy.

The key to soldering to Nitinol is to use an appropriate flux that will effectively reduce both the nickel and titanium surface oxides. Since the devices are used in the human body, it is important that the selected solder alloy has minimum biological activity and the flux residue is completely removed after the soldering operation. Therefore, it is imperative that the selected solder alloy contains no high toxicity metals such as lead, antimony, or cadmium.

The SnAg eutectic solder, 96.5Sn/3.5Ag (Indalloy® #121), is preferred in that the tensile strength of this solder is high, has a reasonable melting temperature of 221°C, is Pb-free, and wets well to Nitinol. The gold-tin eutectic solder, 80Au/20Sn

(Indalloy® #182), has an even higher tensile strength, along with a good resistance to peel, and with a melting temperature of 280°C, can withstand autoclaving temperatures. In using this alloy, a nitrogen protective cover gas had more consistent results and simplified flux removal. The high gold content is also acceptable for in-vivo applications. Although these solder alloys have lower toxicity than common tin-lead solder, it is imperative that the medical manufacturer conduct the necessary tests to ensure that the constituents will have no adverse health effects when used in a particular application within the human body.

In wettability tests, it was found that Indalloy® Flux #2 provides the best wettability to Nitinol. Soldering temperature should be 25°–50°C above the liquidus temperature of the solder. Adequate post soldering cleaning of the flux residue using detergent, water and mechanical scrubbing should be performed. Appropriate testing should be done to ensure that all traces of the flux have been removed.

APPLICATION NOTE

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