Bonding Non-Metallic Materials Using Indium and High Indium Alloys

APPLICATION NOTE

Application

A unique property of indium is that it will wet and bond to certain non-metallics such as glass, glazed ceramics, mica, quartz and various metallic oxides.

Metal/Alloy Selection

Indalloy #4 (100% indium) and Indalloy #1E (52In,48Sn) exhibit the best wetting quality on non-metallics. Indalloy #3 (90In,10Ag) and Indalloy #290(97In,3Ag) exhibit slightly lower wettability, but higher strength, due to the hardening effect of the silver present.

Surface Preparation

Before bonding, thoroughly clean the non-metallic substrate with a strong alkaline cleaner. Rinse with distilled water and rinse again with electronics grade organic solvent, such as acetone. In the case of glass, quartz or glazed ceramics, adhesion is enhanced by heating the material to about 350°C, then cooling to about 200°C.

Bonding Procedure

Apply indium to the heated non-metallic using an indium-plated nickel felt applicator. Rub gently until the non-metallic is coated with a thin film of indium.

To bond two non-metallic substrates together, precoat each surface with indium as described above. Bring the two precoated substrates in contact with each other and reflow at 20-30°C over the liquidus temperature of the solder used to precoat.

To bond a non-metallic substrate to a metallic substrate, precoat the non-metallic surface with indium as described above. Precoat the metallic surface with the same indium alloy as used on the non-metallic surface, using an appropriate flux. Completely remove the flux residue. Bring the two precoated surfaces in contact with each other and reflow at 20-30°C over the liquidus temperature of the solder used to precoat.

In most cases, ultrasonic energy, like that generated by an ultrasonic soldering iron or pot, is effective in promoting wetting of the surface. Bond strengths of 400-700 PSI are typical of this technique.

The following list of four alloys are recommended for bonding non-metallic materials. The melting temperatures and some of the properties of the individual alloys are also listed.

Indalloy Number	Liquidus	Solidus	Tensile Strength PSI	Electrical Conductivity % of IACS	Thermal Coefficient of Expansion µ in/in/°C @20°C	Thermal Conductivity W/cm °C @85°C	Composition
# 1E	118°C	E	1720	11.7	20	0.34	52In 48Sn
# 3	237°C	143°C	1650	22.1	15	0.67	90In 10Ag
# 4	157°C	MP	273	24.0	29	0.86	100In
# 290	143°C	E	800	23.0	22	0.73	97In 3Ag

E= Eutectic, MP= Melting Point

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S O L D E R

INDIUM CORPORATION OF AMERICA®

www.indium.com
askus@indium.com
PRC +86 (0)512 628 34900
SINGAPORE +65 6 268 8678
UK +44 (0) 1908 580400
USA +1 315 853 4900