Recommendations for Coating Components with Braze and Solder Joints

Technical Insight

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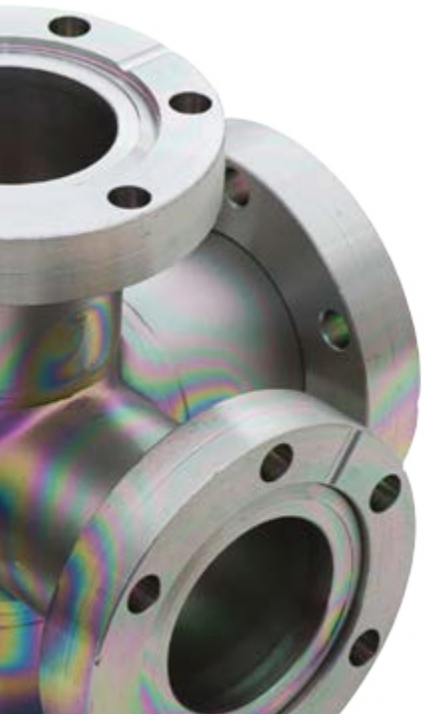

Background

There is ambiguity regarding SilcoTek's capabilities for processing solder and braze joints in customer-supplied parts, with two main concerns:

1. Will the joint physically survive the heat exposure of our process?
2. Will the solder/braze material contaminate SilcoTek processing systems (vessels / lines / other customer parts)?

A third question, "Will the joint area pass SilcoTek's visual inspection criteria?" exists, but it should be known that it is common for the solder/braze joint area to appear "hazy" after processing. Though the coating performance should not be negatively affected, the customer can expect a different visual appearance in the brazed or soldered areas.

Goal

To provide information about brazing and soldering as well as guidelines for treating brazed or soldered parts with SilcoTek's chemical vapor deposition coating process.

Discussion

Brazing and soldering are typically defined by the melting temperature of the filler material, with brazing joints rated to withstand temperatures over 450°C whereby solder joints can fail above 370°C. One common

misnomer, however, is “silver soldering”. Typically, silver soldering is actually a silver braze process and should not have any issues.

Brazing: Click here for an excellent primer on brazing. Brazing is a joining process where metals are bonded together using a filler metal with a lower melting point than the base material. Heat, via torch or furnace, is used to liquefy and allow the flow of filler metal (via capillary action), which then cools, solidifies, and joins the base material. Additional materials, such as flux, may be used to prevent the accumulation of oxides and other undesirable contaminants in the filler metal.

The following materials may be present in filler metal. Formulation is highly variable and unique between most suppliers:

Possible base materials: nickel, cobalt, silver, gold, aluminum, copper
Possible alloying materials: nickel, cobalt, manganese, boron, silicon, iron, chromium, tungsten, aluminum, copper, molybdenum, carbon, titanium, niobium, germanium, and rare Earth elements such an lanthanum, yttrium, etc.

The presence of some of these materials in higher concentration may pose a reason for concern. For example, we know that high levels of copper can cause contamination issues with SilcoTek’s coating systems.

Recommendations for braze joints:
• Most braze joints are compatible with our process temperatures
• Most braze joints will not cause contamination issues
• The most preferred braze method is Vacuum Nickel Brazing. This joining method is highly compatible with our process and does not show cosmetic hazing. Titanium brazing, although not as popular, also coats well.
• For high copper-containing filler material, a general recommendation is to follow our current existing guidelines on copper-containing base materials.

Soldering: Solder filler material may have some of the same components as found in braze materials, such as silver and copper, but it is also alloyed with metals such as tin, bismuth, indium, zinc, antimony, and gold. Click here to learn more about soldering.

Recommendations for solder joints:
• Because of their low melting temperatures, it is not recommended to process parts with soldered areas, especially those with high percentages of tin, lead, and zinc.
• However, the presence of the above materials is not necessarily a smoking gun for a solder joint. It is best to know the specific temperature limitations of the solder material.
• “Silver soldered” is typically not soldered, but rather brazed. Most “silver solder” joints will survive SilcoTek’s processing, but may appear hazy after the coating deposition.

