



TECHNICAL NOTE

PROCEDURE FOR SEALING CERAMIC ADHESIVES

A common requirement for high temperature joining is to produce hermetic seals in the range of 500-1000 deg C. Producing a hermetic seal using a ceramic adhesive is very difficult to achieve. Aremco's ceramic adhesives can be used to provide "partial vacuum" or "gas tight" seals at vacuum pressures not greater than 1×10^{-4} mm of Hg. Producing "high vacuum" hermetic seals with vacuum pressures greater than 1×10^{-6} of Hg is very difficult to achieve with ceramic adhesives because of their inherent porosity.

Guidelines

The following criteria must be observed to achieve the best sealing results with Aremco's ceramic adhesives.

1. The materials to be bonded and sealed should have similar coefficients of thermal expansion (CTE).
2. The clearance between mating parts should be 0.002" to 0.008" (50-200 microns).
3. The length of the "glue line" (seal area length) must be as long as possible.
4. Butt joints are not recommended. Lap, "U" or "L" joints are better designs.
5. Surfaces to be bonded should be clean and free of oils and grease.
6. Surfaces should be abraded or sandblasted wherever possible.

Types of Seals

1. Ceramic-to-Ceramic (such as alumina-to-alumina) => Use Ceramabond 503, 552, 569
2. Ceramic-to-Quartz => Use Ceramabond 503, 552, 569, or 618N
3. Quartz-to-Quartz => Use Ceramabond 618N
4. Ceramic-to-Metal => Use Ceramabond 569 and 668
[For this case, you must try to select metals that match the CTE of alumina.
For example a nickel/iron alloy has a CTE that matches alumina closely.]

Techniques

1. Apply adhesive to both parts then assemble and clamp if possible.
2. Cure at 700 deg F minimum, preferably as high as 1000 deg F for best results.
3. After curing there will still be some porosity in the adhesive.
Porosity should be sealed using one of two products:

A) Seal with the product thinner.

Add a “-T” to the adhesive part number order thinner (ex. 503-T)

These are not chemical thinners in the traditional sense. Instead, the thinner is the binder system used in the designated adhesive. As such, the thinner has adhesive and sealant properties. The thinner will penetrate pores and, upon curing, should provide a good seal.

B) Seal with Aremco-Seal 613 or 617. These are glass-based sealants. As such, it must be flowed at its softening point in order to produce a glass seal. The softening/flow point for 613 is 1250 deg F and 617 is 1600 deg F. If the maximum use temperature of the component should be below the flow temperature of the glass that is selected.