ISO 9001:2000 registered. Established in 1988.

METALLIZATION

Metallization is a coating process of a metallic layer on a non-metallic substrate such as glass, ceramic or polymer. Sometime a metallization may be needed even on a metallic surface. Most of the IJ Research's need on the metallization is for our subsequent brazing or flux-less soldering. A typical ceramic to metal seal needs to have ceramic to be metallized for the subsequent brazing or soldering. Since polymer is not a common material for brazing, IJ Research metallizes mostly on glass and ceramic.

There are four different metallization techniques at IJ Research and they are listed below:

UHT Metallization:

Primarily for high purity alumina ceramics including sapphire and translucent

HT Metallization:

Primarily for alumina including high purity alumina ceramics including sapphire and translucent and all other most popular Al2O3 such as 96% and up and BeO

MT Metallization:

Primarily for carbon products including diamond and graphite, nitride, carbides, BeO and zirconia, ZTA, etc.

LT Metallization:

For many glasses and ceramics, certain sulfide and sulfate and polymers including certain low vapor pressure outgassing epoxies, plastics, etc.

Note: *The above unique processing of UHT, HT MT and LT are IJ Research methodologies.*

Electroplating or electro-deposition is one of the kinds of the metallization in this sense and at IJ Research; it is often called as an aqueous or liquid phase metallization. A vacuum vapor deposition is sometime called at IJ Research as a solid phase metallization.

IJ Research is your source for any/all of these processes. For our turnkey services to customers, it is essential to have them all in house. Metallization at IJ Research has two underlying requirement; the adhesion strength and hermeticity. As a service, IJ Research of course offers a coating service and these will be then coatings.

The adhesion mechanism originates from a thermo-metallurgical, thermo-chemical, thermo-diffusive, thermo-mechanical and some degree of physical adsorption. Hermeticity originates from various reactions at the sealing interface and a physical size of the sealing area or depth along with thermal properties of the component materials

Consideration in metallization:

Mo/Mn high temperature refractory metallization: The bonding mechanisms are Mn aluminate spinel ($MnAl_2O_4$), alumino-silicate (Al_2SiO_5), as well as alumino-manganese silicate from the sintering process.

A sufficient thermodynamic condition must be met in the process and they are basic thermodynamic variables of composition (of metallization and braze materials), temperature (with all the processing rates and dwell time) and pressure (including specific atmosphere or vacuum level) in order to achieve the highest adhesion strength and the required hermeticity.

The metallization on ceramic is a surface conditioning for the brazing in a ceramic to metal seal assembling. Obviously, in this ceramic to metal sealing, both the metallization and the brazing go together. IJ Research takes care of both the metallization and the brazing.

MT metallization is for stabilized zirconia, borides, carbides, nitrides and carbon materials such as diamond, graphite and carbon composite. IJ Research metallizes at a low temperature using our own MT metallization material.

Mo/Mn high temperature refractory material can be used for BeO but the sintering temperature is high and the toxicity could be an issue. The MT can be an alternative technique for BeO. Since Mo/Mn doesn't work on the AIN, we use our own MT for AIN.

Please contact IJ Research using 1-714-546-8522 or info@ijresearch.com.

METALLIZATION

LT metallization: Some theoretical consideration is presented herein for your review. The vacuum evaporation process requires certain high vacuum (low pressure). The processing is a function of initial pressure, pumping speed, out gassing rate and volume of the chamber. The amount of the metallization gas molecules is a function of chamber volume as well as the vacuum level of the chamber and the temperature per a simple gas law, PV = nRT

IJ Research engineers calculate the impingement rate of the gaseous metallization molecules hitting the substrate and the time required for one layer of the metallization. We approximate final thickness of the metal on the substrate or monitor and control the required thickness using an in situ thickness monitor or a surface profilometer.

Our facility contains an extensive line of vacuum evaporators and sputtering systems along with all the inspection systems

You might be interested in reading another Corporate Literature called *Ceramic to Metal Seal.*