Packaging Materials

Honeywell

Honeywell Evaporation Products

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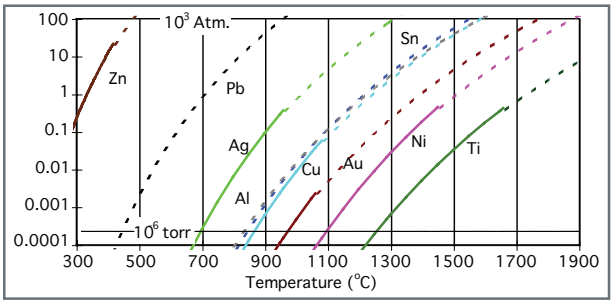
METALS FOR DIEBACK METALLIZATION AND UNDERBUMP METALLURGY (UBM) FOR FLIP CHIP APPLICATIONS

OVERVIEW

Metal evaporation is one of the most common methods of applying die back metallization and under bump metallurgy for flip chip applications. This technology is well established, more cost-effective than sputtering and also allows for higher throughput. Honeywell Electronic Materials manufactures a wide variety of evaporation materials. Al, Al alloys, Ag, Au, Au alloys, Cu, Ni, Pb, Sn, Ti, and Zn are available as wire, rods, slugs, pellets, or supercharges. The vapor pressure as a function of temperature is plotted in the figure below for these elements.

Slugs are sheared or cut from wire or rod and are longer than they are in diameter. This is typically one of the most economical and efficient sources of evaporation materials, particularly for strong materials like Ti and Ni. These slugs can be packaged either in argon-filled plastic bags or jars.

Vapor Pressure versus Temperature



Solids are shown with a solid line and liquids with a dashed line. Al, Sn, and Cu have nearly identical vapor pressures over this temperature range.

Common Evaporation Materials, Melting Points and Purities

Element/ Alloy	Melting Point (°C)	Purity	Element	Melting Point (°C)	Purity
Al	660	49, 59, 59.5	Ni	1455	39.7
Ag	962	49, 59	Pb	327.5	49
Au	1064	49, 49.5, 59	Sn	232	49, 59
Au 2Si, Au 3.1Si	800, 363	49, 59	Ti	1670	49, 59, 59.5
Au 0.5Ge, Au 2Ge, Au12Ge	361	49, 59	Zn	420	49, 59, 69
Cu	1085	49, 59, 69			

- The standard Honeywell list of elements is: Ag, Al, As, Au, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Ga, Ge, Hg, In, Mg, Mn, Mo, Ni, Pb, Pd, Pt, Sb, Si, Sn, Sr, Te, Ti, Tl, V, Zn, and Zr. If one or more these elements are major constituents in the material then they will be reported as major constituents rather than as impurities.
- Cutting is only used for very hard materials that cannot be sheared effectively.

PURITY AND ALPHA FLUX

Purity is based upon the total metallic impurities from a list of 35 elements that are measured by Honeywell. Purity levels range from 99.9% (39) to 99.9999% (69) depending upon both the alloy and the application. Most materials are also available with low alpha flux. A complete chemical analysis and quality assurance report are included with each lot.

PRODUCT DIMENSIONS

A wide range of wire, pellet, slug, and supercharge sizes is available. This wide variety of part sizes and shapes allows Honeywell parts to be used on nearly all customer evaporation equipment. Finished evaporation materials are surface cleaned and packaged under argon.

Wire or rod is available in diameters from 0.040" (1.02mm) to 0.500" (12.7mm) depending upon the alloy. Wire is normally supplied on 4" (101.6mm) diameter spools, but can be supplied on other sizes by special request. Rod is cut to lengths of up to 36" (0.914m) and packaged on a cardboard carrier.

Pellets are punched from rolled strip and are larger in diameter than they are thick. Honeywell Electronic Materials has an extensive punch tool list that includes over 200 disk diameters ranging from 0.020 (0.508mm) to 2.00 (50.8mm) in diameter. In addition to disks we have a similar number of square and rectangular tools that can be used to punch specialty pellets. These pellets can be packaged either in argon-filled plastic bags or jars.

Superchargers are relatively large machined evaporation sources which are designed to fit into the evaporation cup. They are commonly used when an evaporation source is first put into service to avoid having the electron beam impinge on the cup material. They are normally a truncated cone and can have a well machined into the larger, upper surface to facilitate filling with material of one of the lower cost shapes listed above during operation.

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