purity Cu. Addition of La<0.002wt%, Ce<0.003wt%, Ca<0.004wt% to a 4N Cu wire revealed a long storage life.

Generally, secondary alloyed Cu wires are in demand with good bondability, free air ball formation in an inert or reactive environment, reliability, in particular under highly accelerated stress test (HAST), good looping performance and easy to wire draw in mass production scale properties. Slight increase in the resistivity by 5-15% is typically the disadvantage of doped Cu wires. However, if the wire exhibits superior reliability performance especially under HAST, the wire is attractive even with increased resistivity and cost.

Example embodiments of the present invention seek to provide 1N secondary alloyed Cu wire for bonding in microelectronics that can provide high reliability performance with reduced compromises in other properties.

SUMMARY

According to an aspect of the present invention, there is provided a secondary alloyed 1N copper wire for bonding in microelectronics comprising at least one ~~or more~~ of ~~a group of Ag, Ni,~~ Pd, Au, and Pt, ~~and Cr~~ as corrosion resistance alloying material, wherein a concentration of said corrosion resistance alloying material is between ~~about~~ 0.99wt% and ~~about~~ 9.9wt%.

~~The corrosion resistance alloying material may comprise about 0.99wt% to about 9.9wt% of Ag.~~

~~The corrosion resistance alloying material may comprise about 0.99wt% to about 9.9wt% of Ni.~~

The corrosion resistance alloying material may comprise ~~about~~ 1.18wt% to ~~about~~ 9.9wt% of Pd.

The corrosion resistance alloying material may comprise ~~about~~ 0.99wt% to ~~about~~ 9.9wt% of Au.

The corrosion resistance alloying material may comprise ~~about~~ 0.99wt% to ~~about~~ 9.9wt% of Pt.

~~The corrosion resistance alloying material may comprise about 0.99wt% to about 9.9wt% of Cr.~~

~~The corrosion resistance alloying material may comprise about 0.005wt% to about 0.1wt% of Ag and about 0.09wt% to about 9.8wt% of Ni.~~

The corrosion resistance alloying material may comprise ~~about~~ 0.005wt% to ~~about~~ 0.1wt% of Ag and ~~about~~ 0.09wt% to ~~about~~ 9.8wt% of Pd.

The corrosion resistance alloying material may comprise ~~about~~ 0.005wt% to ~~about~~ 0.1wt% of Ag and ~~about~~ 0.09wt% to ~~about~~ 9.8wt% of Au.

The corrosion resistance alloying material may comprise ~~about~~ 0.005wt% to ~~about~~ 0.1wt% of Ag and ~~about~~ 0.09wt% to ~~about~~ 9.8wt% of Pt.

~~The corrosion resistance alloying material may comprise about 0.005wt% to about 0.1wt% of Ag and about 0.09wt% to about 9.8wt% of Cr.~~

The corrosion resistance alloying material may comprise about 0.005wt% to about 0.1wt% of Ag and about 0.09wt% to about 9.6wt% of Ni.

The corrosion resistance alloying material may comprise about 0.005wt% to about 0.1wt% of Ag and about 0.09wt% to about 9.6wt% of Pd.

The corrosion resistance alloying material may further comprise about 0.008wt% of P.

The corrosion resistance alloying material may further comprise about 0.005wt% to 0.013wt% of a deoxidizer alloying material.

The deoxidizer alloying material may comprise about 0.005wt% of Ca, Ce, Mg, La and Al.

The deoxidizer alloying material may further comprise about 0.008wt% of P.

The corrosion resistance alloying material may comprise ~~about~~ 0.005wt% to ~~about~~ 0.1wt% of Ag, ~~about~~ 0.09wt% to ~~about~~ 9.6wt% of Ni, ~~about~~ 0.005wt% of Ca, Ce, Mg, La and Al, and ~~about~~ 0.008wt% of P.

The corrosion resistance alloying material may comprise ~~about~~ 0.005wt% to ~~about~~ 0.1wt% of Ag, ~~about~~ 0.09wt% to ~~about~~ 9.6wt% of Pd, ~~about~~ 0.005wt% of Ca, Ce, Mg, La and Al, and ~~about~~ 0.008wt% of P.

The corrosion resistance alloying material may further comprise ~~about~~ 0.02wt% to 0.29wt% of a grain refiner alloying material.

The grain refiner alloying material may comprise ~~about~~ 0.005wt% to ~~about~~ 0.2wt% of Fe, ~~about~~ 0.005wt% to ~~about~~ 0.05wt% of B, ~~about~~ 0.005wt% to ~~about~~ 0.02wt% of Zr, and ~~about~~ 0.005wt% to ~~about~~ 0.02wt% of Ti.

The secondary alloyed 1N copper wire may further comprise ~~about~~ 0.0003wt% of S.