Editorial

Durable, reliable, trusted

Anyone doubting the extent to which gold is a key material in the electronics industry needs only to consider the following facts to be persuaded. Since 1980 over 5600 tonnes of gold have been used by manufacturers of electronic and electrical goods. At today's gold price that is a mind-boggling \$216 billion of gold and current annual demand for gold by these manufacturers constitutes about 8% of total demand. Therefore gold and the electronics industry continue to be very much interwoven.

To reflect the importance of the electronics market to the gold market, this special issue of *Gold Bulletin* is devoted to the 'use of gold in electronics'. It covers not just current uses of the metal such as gold bonding wire and electroplating, but also some emerging future uses of gold in advanced electronic technologies; gold nanoparticles to enhance the memory capacity of flash memory devices and gold nanoparticle inks for low temperature printing applications are the two areas we cover in this issue. There are many others emerging including luminescent gold complexes for organic light emitting diodes (OLEDs) and the use of gold in optronics.

This special issue also looks at the hot issue of recycling. It is a little known fact that over 50% of the value of an old mobile cell phone or printed circuit board from an old computer relates to the gold inside it. Extraction of the gold (and to a much lesser extent the other precious metals) makes economic sense and this process is a growing industry, in part driven by legislation. In this way, gold can be seen as the key foundation for the end-of-life recycling of electronics. However, although end-of-life recyclability of electronic goods is becoming an increasingly important issue, it is surprising that very few chip design and manufacturing companies are influenced by the essential role of gold in the economic viability of waste electronics recycling.

Delving into the industry a little deeper we find that each year, billions of electronic devices trust in gold bonding wire to deliver reliable performance; it has been estimated that trillions of gold bonding wires are connected in electronics each year. However, with the rising price of gold, many companies are understandably looking to save costs. They are looking to switch to cheaper materials like copper particularly for high volume products with low margins, where reliability is not a major concern. However, as recent market research by the World Gold Council shows, the semiconductor industry still has major issues about this switch. Reducing the amount of gold consumed, whilst maintaining the inherent reliability of a gold bonding wire solution, is an alternative viable strategy for cost reduction. Solutions include reducing the overall length of gold wire through optimisation of the 'loop height' of the wire or indeed design changes to minimise wire usage (for example, using thinner wires for signal wires and thicker wires for power wires). It is important that wire suppliers assist their customers to reduce the impact of the metal price on the overall cost of gold bonding wire technology.

So what of the future? What might gold usage in electronics look like in 2020? The rapid nature of development in electronics means that is almost impossible to predict and will of course depend on the price of gold and the types of consumer electronic products that emerge in the next decade. Undoubtedly though, gold will continue to play a key role in an industry where durability, reliability and performance must be trusted.

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