

# PGM IN GLASS MANUFACTURING



Glass manufacturing represents one of the largest industrial demand areas for platinum group metals. With high melting points and corrosion resistance, pgm have long been essential in the manufacture of high-purity optical glass, glass fibre and, more recently, TFT-LCD panels. The market for pgm in glass manufacture tends to be cyclic; a large amount of demand comes from new glass plants, driven by technology choices, consumer trends and economic growth. Recycling periodically returns metal from older manufacturing facilities, lending interesting dynamics to the glass market.

## PGM IN GLASS

The glass industry has been a major user of platinum and platinum-rhodium alloys for many years. Platinum and pgm alloys are used in the linings of vessels that contain, channel, and form molten glass, as well as in self-supporting fabricated parts and in coatings on surfaces such as ceramics. Platinum's high melting point and resistance to corrosion make it suitable for use in the aggressive environment of molten glass. The alloying of platinum with rhodium, and the micro-alloying of platinum with zirconia, further increase the material's mechanical strength when used in linings and fabrications. Use of pgm helps extend the durability and lifetime of equipment, improve return on investment, lower total energy requirements and ensure that the end-product is free of defects. A crucial advantage of pgm is that they are recyclable: typically 95 to 98% of the metal used can be recovered and it is mostly reused in similar glass applications; recovery of metal in the glass industry is an example of 'closed loop' recycling.

## TYPES OF GLASS MANUFACTURING

One of the largest uses for pgm in glass manufacture is in the production of **glass fibre**, a component of glass-reinforced

plastics and construction materials. In this process, molten glass is drawn through a platinum-rhodium bushing, a vessel with hundreds of precisely dimensioned holes in its base, allowing extremely fine fibres of glass to be consistently produced. The resurgence in industrial demand for glass fibre in 2010 meant that around 150,000 oz of platinum went into that application.

In the manufacture of glass used in active-matrix thin-film transistor liquid crystal display (**TFT-LCD**) panels, used in most television and computer displays on the market at present, pgm components are essential. The substrate in TFT-LCD panels is a thin sheet of non-alkali ion-free glass on which the TFT structure is fabricated. The glass substrate must be extremely smooth, of uniform thickness and not contain any charge-carrying particles that could migrate into the TFT structure and reduce image quality in the finished product. Platinum and rhodium linings are therefore used to channel the molten glass throughout the manufacturing process, making TFT-LCD glass production the most intensive user of pgm per unit of glass manufactured. Different technologies use varying amounts of pgm, but some latest-generation tanks contain up to a tonne of platinum. Melting tanks,

refining channels and stirring cells, where the raw materials are mixed and the glass is homogenised, have to be capable of withstanding temperatures of up to 1,650°C, while remaining inert in order to ensure the finished product is defect-free.

**Cathode Ray Tube (CRT) glass** manufacture has historically been a strong demand area for pgm. Platinum–rhodium fabrications or coatings are used in the glass forming part of the process to protect bowls, stirrers and orifice rings.

Like TFT–LCD glass, **optical glass** requires platinum components throughout the manufacturing process in order to produce flawless lenses. In this case, pure platinum components are preferred for melting, conditioning and forming, as rhodium alloys can cause unwanted colouration of the glass.

A new and growing area is in glass for solar photovoltaic panels. This **solar glass** needs to be highly transmissive and free of blemishes. In this, as in other applications, pgm coatings and fabrications are required to protect and extend the lifetime of individual process components.

#### THE CURRENT MARKET

In 2010, new purchasing of platinum and rhodium was driven by two main technology trends: a move by consumers away from older CRT technology in televisions, monitors and other display units and the growth in consumer demand for TFT–LCD panels, particularly in mobile devices such as handheld ‘tablet’ computers. A third trend was the resurgence of the glass fibre manufacturing industry in 2010, as the construction sector picked up in better economic conditions. Overall, pgm usage in the glass manufacturing sector was in an upswing in 2010 as demand from new facilities outweighed the return of metal from older ones. This was precisely the opposite situation to 2009 when returns from older, decommissioned plants outweighed new and top-up demand.

CRT display technology has been in decline for several years. Devices which have achieved mass-market uptake in the last twenty years, such as mobile phones and laptops, require flat-panel display technology, usually TFT–LCD panels. Consumer preference has also moved towards TFT–LCD technology in televisions and monitors, and it is expected that all CRT production will cease by 2015. This trend has meant that a large amount of pgm has been recovered from CRT factories, which has effectively netted off new demand elsewhere.

Unit sales of TFT–LCD technology for flat-panel displays and mobile devices have grown rapidly over the past few years with the introduction of inexpensive and ever-larger panels. Most TFT–LCD panels use two sets of high-quality display glass

coated with electrodes between which the liquid crystals lie. Some devices use a third layer of thin, high-strength sheet glass as a protective cover, which offers greater durability and scratch resistance to handheld devices with touch screens. The rapid uptake of such devices represents considerable new demand for pgm in the production of multiple layers of blemish-free glass.

The recovery of the world economy during 2010 led to increased glass fibre manufacturing. Growth in demand for platinum bushings from both new capacity and replacement of older equipment has therefore taken place. Strong, lightweight glass fibre composites are increasingly required in the aerospace, automotive and construction industries. Considerable new capacity is being installed for glass fibre manufacture, although some of the pgm requirements are being met from metal already in manufacturers’ inventory.

#### OUTLOOK

Demand for increasingly sophisticated electronic displays, solar panels and lightweight, durable glass fibre composite materials looks set to grow in the next few years. PGM use in manufacturing glass for these various applications offers unique operational characteristics. The glass industry is an example of a sustainable application of pgm: in addition to the high proportion of metal that is recovered from closed loop recycling, pgm also offer benefits in terms of extending component lifetimes and reducing expenditure.

