materials this could present insurmountable difficulties. While cladding, relying on metal strength achieved by using sheets of platinum group metals over refractories has been beneficial for long periods of service, the metal requirement is high and therefore expensive.

New ACT™ coatings effectively combine the best features and properties of both ceramics and platinum group metals, and give the operational durability and efficiency required by the glass industry. ACT™ platinum coating of forming-end ceramics has demonstrated major potential for improving glass making operating practices. It has highlighted the benefits possible in control of gob diameter, shape and weight, and has brought stability to the forehearth operation. Major reductions in downtime now provide higher productivity and lower manufacturing costs.

ACT™ platinum coating for tri-level thermocouple sheaths is now a major world-wide product. Trials that have been undertaken on forehearth forming-end consumables have demonstrated the wider applicability of ACT™ coating technology, from which glass makers are now benefiting. It is anticipated that ACT™ coatings will find increased use in glass furnaces as the best combined features and properties of ceramics and metals are sought. These developments will require the integration of technologies, notably those of the ceramicist, the metallurgist, the glass technologist and the furnace builder to ensure that the maximum benefit is gained by customers and manufacturers.

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Ruthenium Improves Corrosion of Stainless Steel

Duplex stainless steels containing typically chromium, nickel, molybdenum and nitrogen, and having approximately equal volume fractions of austenitic and ferritic phases in their microstructure, are used in aggressive chemical and marine environments where high corrosion resistance is required, such as in heat exchangers, desalination plants, food pickling and mine waters. However, there is always a demand for improved corrosion resistance in these steels to cope with increasingly severe environmental conditions, and much work has been done to meet this. In particular, it is known that small additions of the platinum group metals improve corrosion resistance in stainless steel (1). Similar improvements have been observed after adding platinum group metals to duplex stainless steels with low-chromium contents, but no research had been done on the effects of adding platinum group metals to high-chromium duplex alloys.

Now, research from South Africa, involving immersion in sulphuric acid and electrochemical measurements, has shown that the addition of just 0.28 per cent of ruthenium to duplex stainless steel: iron-29 per cent chromium-14 per cent nickel-3 per cent molybdenum can increase the corrosion resistance of the base alloy by improving the hydrogen evolution efficiency and by inhibiting anodic dissolution (2). Adding ruthenium moved the corrosion potential towards more noble values. As the nitrogen content in these alloys was extremely low, in order to obtain the desired microstructure the nickel content was higher than usual; this additionally benefited the observed corrosion resistance.

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