

metal phases were stable only to about 500 to 550°C (9). Coating costs based on a platinum cost of \$500 per troy ounce were estimated to be about \$4 to \$5 a square foot when deposited over large areas. This cost is dominated by the cost of the platinum in the low emittance base layer, \$3 a square foot, but this is not unreasonable for high performance receivers. Alternative base layer materials such as carbon, nickel,

molybdenum and zirconium boride were tested and found to yield inferior performances compared to the platinum (9).

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## Catalytic Retexturing of Platinum Surfaces

The occurrence of surface restructuring in platinum based catalysts is well known, perhaps the best example being that produced in platinum-rhodium gauzes during the oxidation of ammonia. Many previous investigations into the nature of this surface change have used very low pressures and clean platinum surfaces, such as single crystal faces. A study of the heterogeneous oxidation of carbon monoxide on platinum wire, carried out at atmospheric pressure and temperatures up to 600K, has been reported (A. K. Galwey, P. Gray, J. F. Griffiths and S.M.Hasko, *Nature*, 1985, **313**, (6004), 668).

Kinetic measurements were made using the catalyst, in the form of a coil, as its own resistance thermometer. The difference in power supplied to maintain a constant mean wire temperature in first an inert and then a reactive gas mixture was related to the heat of reaction at that temperature. Under oxygen-rich conditions, kinetic and diffusion controlled regimes were identified, with hysteresis between the two causing a region of instability.

The surface of wires, after several hours at 500K, developed a structure similar to that produced by the oxidation of ammonia on platinum. X-ray energy dispersive and wave dispersive analyses indicated the presence of a

surface layer of PtO in both textured and unchanged areas of used catalyst wires and also at the surface of pristine wires.

To explain their observations, the authors suggested that recrystallisation occurs only on the surface of suitably oriented grains, textural discontinuities being caused by grain boundaries. It is proposed that at temperatures well below the melting point of platinum (2045K), surface atoms have considerable mobility and that PtO actively promotes or controls the reaction. These considerations are consistent with two alternative representations of the oxidation process. In the first, surface oxide is reduced by chemisorbed carbon monoxide, with carbon dioxide formation occurring at the metal-metal oxide interface. In the second, platinum in a mobile chemisorbed phase bonds with carbon dioxide and/or carbon monoxide by transitory compound formation to produce two-dimensional intermediates. It appears that surface concentrations of active constituents are sensitive to prevailing conditions and previous catalyst treatment.

Much remains to be learnt regarding the chemistry of surface species on platinum catalysts if the mechanism of reactions such as these are to be better understood. E.P.W.