been extended. A new testing and sampling laboratory has also now been opened by Tanaka Matthey in Japan.

Plans for mass production of catalyst units have proceeded simultaneously with the testing programme. Following the development of a successful pilot plant, two full-scale production plants are being built, one at Johnson Matthey Chemicals factory at Royston, England and the other at Matthey Bishop's Devon, Pennsylvania facility.

The difficulties of eliminating the hazards caused by automobile exhaust emissions have posed formidable problems. Of the alternative systems for the control of these emissions, platinum catalysts offer the best prospect of solving difficulties at the present time.

Doubts about the availability of platinum to equip all the new vehicles that will have to conform with the more stringent emission standards – engendered in part by the campaign to secure postponement of the legislation – are no longer realistic. What might at one time have been regarded as a difficult supply situation in the first year is no longer likely. The slower introduction of the more stringent standards provides time for the expansion programme already undertaken at Rustenburg to become effective before the full requirements are felt. In addition, as has so often been the case when a new major use of platinum is introduced, development of the technology has shown that less platinum will be needed in each device than had earlier been contemplated. At this time it seems clear that sufficient platinum will be available to satisfy the growth requirements of the established users and to provide comfortably for the needs of the automobile industry.

References

1 G. J. K. Acres and B. J. Cooper, *Platinum Metals Rev.*, 1972, **16**, (3), 74–86

2 G. J. K. Acres, *Platinum Metals Rev.*, 1970, **14**, (1), 2–10; *Ibid.*, 1971, **15**, (1), 9–12; *Ibid.*, (4), 132–133

3 G. J. K. Acres, *Platinum Metals Rev.*, 1970, **14**, (3), 78–85

4 J. B. Hunter, *Platinum Metals Rev.*, 1968, **12**, (1), 2–6

5 R. A. Searles, *Platinum Metals Rev.*, 1973, **17**, (2), 57–63

Rhodium and Iridium of Improved Ductility

Rhodium and iridium are more difficult to work than any other face-centred cubic metal and no completely satisfying explanation for this anomalous behaviour has yet been advanced. It is now ten years since Dr Reinacher of Degussa first demonstrated the advantages of platinum sheathing, which allowed working temperatures to be reduced to levels which encouraged the formation of a fibrous texture within the wire or sheet being produced.

Platinum, however, tends to alloy with the rhodium or iridium being worked and is very difficult to remove completely by etching, so cheaper and more effective alternatives have been sought. Dr Reinacher has now shown (*Metall*, 1973, **27**, (1), 1–4) that rhodium and iridium of excellent ductility can be obtained by working within a pure nickel envelope which can be readily removed by etching.

Hot rolled rhodium and iridium rods having a diameter of about 3 mm were sealed within nickel tubes having a wall thickness of 1.8 mm. The rhodium assemblies were then rolled at temperatures of 800°C and below into wires approximately 1 mm diameter. The iridium assemblies needed working at 1000°C to avoid cracking on rolling.

Rhodium wires with a fibrous structure and high ductility were then obtained by etching away the nickel sheath and drawing the wire through carbide dies at temperatures down to 350°C. Higher temperatures were needed for drawing the iridium wires and, since sheath removal was found to be essential for the production of round wire of uniform diameter, complete freedom from cracking was only avoided by working at 1000°C. Iridium wire so produced retained its fibrous structure and at a diameter of 0.2 mm could be safely coiled round a 2 mm mandrel.

The effectiveness of this procedure is attributed by Dr Reinacher to the way the nickel isolates the surface of the refractory noble metal from the severe local and unsymmetrical deformations inevitably associated with hot working in grooved rolls.