saving of $6,000,000 per year on propylene plus synthesis gas ($CO+H_2$) feedstock may be achieved on a large commercial plant. Previously it has been necessary to recycle the unwanted *iso*-butyraldehyde, for example as fuel, and pressures of around 300 atmospheres have had to be used with the cobalt catalysts.

The new process technology possesses other advantages. The relatively low pressures in the reaction enable synthesis gas to be introduced directly into the oxo plant and obviates the necessity to use high pressure compression equipment. This in turn reduces both capital costs and operating costs, as might be expected from the relative simplicity of the techniques employed. The catalyst is much easier to handle during operation.

The first three plants using the new technology are being built for Union Carbide Corporation itself. A 130,000 ton/year plant for the production of *n*-butyraldehyde from propylene is under construction at the Ponce complex in Puerto Rico. Two units with a capacity of 45,000 ton/year for the production of propionaldehyde from ethylene are under construction at Texas City. These new plants will come into operation during 1975.

The first external licensee of the new process is in Sweden. Berol Kemi of Stenungsund is to build an oxo plant based on the propylene-to-*n*-butyraldehyde conversion to go on stream by early 1978. This plant is to have a capacity of 100,000 ton/year of *n*-butyraldehyde. Other products to be manufactured in this plant include butanol, octanol and octanoic acid.

Davy Powergas Limited, a member of the Davy International Company, will participate in the construction of all these plants, and the rhodium-containing catalyst will be supplied by Johnson Matthey Chemicals Limited.

Intercrystalline Rupture of Platinum Alloys

GRAIN BOUNDARY MIGRATION AND INTERCRYSTALLINE SLIP NEAR WELDS

The fabrication of articles from platinum alloys generally requires the use of welding techniques but the difficulty sometimes arises that intercrystalline cracking occurs in the vicinity of the welded seam. The exact conditions under which this problem arises have yet to be fully defined. However, progress in this direction has been made by a team of workers at the Ural Polytechnic Institute named for S. M. Kirov (V. V. Stepanov, T. A. Chernyshova and V. V. Shevelev, *Fiz. Metal. Metalloved.*, 1975, **39**, (1), 183–188).

The alloys studied were 7 per cent rhodium-platinum, 10 per cent rhodium-platinum and 5 per cent rhodium–15 per cent palladium-platinum. Results were obtained for the effect of chemical composition on the tendency to crack formation and for the process of grain growth during repeated welding cycles.

A large number of welds and their surrounding zones were observed in all three alloys. These indicated that twice as much cracking occurred in the ternary alloy as in 7 per cent rhodium-platinum but that the least amount of cracking occurred in 10 per cent rhodium-platinum. Small additions of magnesium, iron, calcium, aluminium, and silicon and of their combinations were made to the alloys. It was found that more cracking resulted, particularly induced by additions of silicon, aluminium and calcium.

Fractographic analysis was undertaken to establish the mechanism of cracking before attempting to eliminate it. Two features became apparent. First, lines of intercrystalline slippage develop and, secondly, secondary phases in the form of fine dark deposits occur on the facets and boundaries of the crystals. The latter incorporate the deleterious additions.

A suggested mechanism for crack formation is that voids form between crystals because of slip. The links between crystals are thus broken and cracking is initiated. To verify this mechanism grain growth was observed closely in the weld and in the surrounding area. The thermal effects of welding induce grain growth in the alloys and this in turn may cause the intercrystalline slip which leads to voids and rupture at certain temperatures of welding, especially for impure alloys.