affinity for zirconium of very dilute zirconium-platinum alloys appears to be very formidable indeed.

Although thorium is almost completely insoluble in solid platinum, the heat that is evolved when liquid alloys are formed confirms the very high affinity of platinum for thorium. In the absence of terminal solid solubility any thorium vapour which meets a platinum surface at temperatures above 1337°C will immediately form liquid. The presence of such a liquid layer on a solid platinum surface would be expected to facilitate metal transfer processes.

The practical implications of these refractory decomposition processes for the long-term stability of platinum thermocouples when in contact with various refractories will be discussed in the final article in this series.

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Combined Catalysts for Ammonia Oxidation

PLATINUM ALLOY GAUZES IN NITRIC ACID PRODUCTION

Oxidation of ammonia over platinum alloy gauzes remains the most efficient method of producing oxides of nitrogen in nitric acid plants. However, studies in Russia have been directed towards replacing part of the pad of platinum alloy gauzes used in the conventional reactor by non-platinum metal catalysts. As long ago as 1958 Russian workers showed that combined catalysts, consisting partly of gauzes and partly of a layer of another catalyst, were effective in ammonia oxidation, thereby reducing both the amount of platinum alloy gauze required and the loss of platinum metal from the gauze during the reaction.

A. P. Zasorin, N. F. Kleshchev and V. I. Atroshchenko have now shown (*Khim. Promyshlennost'*, 1970, (7), 513–514) that a layer of iron oxide-chromium oxide catalyst can be used in conjunction with platinum alloy gauzes in high pressure ammonia oxidation plants. Most of the conversion still takes place on the platinum alloy gauze and the total yield of the combined catalysts is somewhat less than where gauzes alone are used but if economic considerations dictate the use of less platinum then the studied method is a practical proposition.

Tests were carried out at pressures of 5 and 10 atmospheres and at 1150 K using a pad of seven palladium-rhodium-platinum gauzes and a layer of 93 per cent Fe_2O_3 – 7 per cent Cr_2O_3 catalyst of thickness varying from 120 to 270 mm. The amount of ammonia conversion at the platinum alloy gauze was 81 per cent at 5 atm, and 78 per cent at 10 atm. As the layer of iron-chromium oxide increased in thickness the total conversion rose from 91 to 97 per cent at 5 atm, and from 87 to 94.5 per cent at 10 atm, i.e., a greater thickness of the non-platinum metal catalyst bed results in greater conversion, as might have been expected.

The authors suggest that a layer of oxide catalyst 25 to 30 mm thick is equivalent to one platinum gauze, a layer 120 mm thick to 4 to 5 gauzes; 270 mm thick, 9 to 11 gauzes.

The normal practice of the authors appears to have been to use a pad of from 16 to 19 gauzes at these pressures. They now suggest that a pad of 6 to 7 gauzes with a catalyst bed 200 to 220 mm thick is adequate at 5 atm, and that a bed of oxide catalyst 300 to 330 mm thick is adequate with the same number of gauzes at 10 atm.