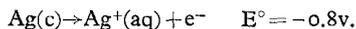


other texts; e.g. for the cell reaction



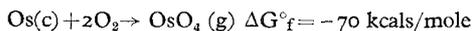
All the cell reactions are written as oxidations; i.e. with the electrons on the right-hand side.

The equation

$$\Delta G^\circ = -RT \ln K = -1.360 \log_{10} K$$

is also used to calculate ΔG° for some reactions ($T=298^\circ\text{K}$, and K is the equilibrium constant of the reaction).

From these data ΔG°_f values are tabulated for a number of compounds in the solid and (occasionally) gaseous states and for aqueous solutions. This standard free energy of formation is the most useful thermodynamic quantity for practical application; if it is negative, as in



the reaction should proceed spontaneously in the direction indicated. However, this tells us nothing of the rate of such a reaction, merely that it is thermodynamically possible. If ΔG°_f were large and positive the reaction could not proceed spontaneously, with or

without a catalyst. Of course, by proceeding to non-standard states of reaction the balance may be changed. It is also possible to calculate equilibrium constants for reactions involving the compounds quoted by using these ΔG°_f values together with other readily available data.

Potential diagrams are given for the various oxidation states of the elements, and these provide a useful shorthand way of summarising information on the relative stabilities in solution of their various oxidation states.

In short, this review provides at least a foundation for the more quantitative aspects of platinum metal chemistry. It should stimulate further research in a field which, for the platinum group elements, has received less attention than it deserves.

References

- 1 R. N. Goldberg and L. C. Hepler, *Thermochemistry and Oxidation Potentials of the Platinum Group Metals and their Compounds*, *Chem. Rev.*, 1968, **68**, 229.
- 2 W. M. Latimer, *Oxidation Potentials*, Prentice Hall, Second edition, 1959.

One Million Ounces of Platinum

RUSTENBURG'S INCREASED OUTPUT

Since 1964 there has been a fourfold increase in the output of platinum from Rustenburg Platinum Mines, for whom Johnson Matthey are the refiners and distributors. The last big increase was announced a year ago, when extensions to mining and refining operations were put in hand to provide an output of 850,000 ounces of platinum a year.

It has now been decided to expand the rate of production to approximately 1,000,000 ounces of platinum a year, with of course corresponding increases in the supply of rhodium, ruthenium, palladium and iridium.

This decision has been made in the light of current assessments of demand during the next five years, notwithstanding the announcement by Universal Oil Products of a new petroleum reforming catalyst that will utilise platinum more efficiently for a given reforming capacity. This new catalyst will give higher yields, improved stability in operation and increased quantities of by-product hydrogen in the widely used Platforming process while it will also help in reducing the amount of contaminants in high-octane fuels which are contributory to air pollution.



A new shaft headgear in course of construction at Rustenburg