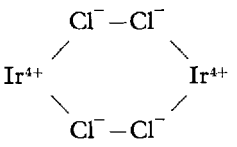
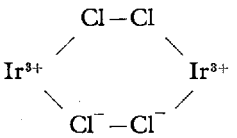
complexes occupying nearest neighbour positions in the crystal lattice, which has face-centred cubic structure. The pair could be represented diagramatically by the structure



if the two unpaired spins were localised on their respective iridium ions. However, the measurements described above show that there is an 0.5 per cent chance of finding these spins on adjacent Cl atoms giving a possible structure of the form



There can then be an exchange interaction between the two unpaired electrons rather like that which occurs in a Cl_2 molecule.

The lowest energy levels of this system are a ground state singlet (spins anti-parallel) and a triplet (spins parallel) higher in energy by the antiferromagnetic exchange interaction J.

The paramagnetic resonance spectrum from the triplet and the temperature dependence of its intensity gives a direct measure of this exchange interaction, $J=5$ cm^{-1}. In the concentrated salt, $(NH_4)_2IrCl_6$, it is found that the magnetic susceptibility obeys a Curie-Weiss law with Weiss constant $\theta=20°K$. This value is in good agreement with that predicted from the directly measured $J=5$ cm^{-1} in semidilute crystals. It is also found that the salt goes antiferromagnetic at 2.1°K, and a direct knowledge of J is very helpful in the interpretation of this transition.

This method of studying the mechanism and the magnitude of exchange interactions, which is perhaps the only direct method available, is applicable to any antiferromagnetic which can be diluted by replacing the magnetic ions by diamagnetic ions. Work is at present in progress on other platinum group compounds, and also on the well-known antiferromagnetic oxides of the iron group.

In conclusion, it may be said that the paramagnetic resonance investigation of platinum group compounds has so far been a very interesting problem, because it has contributed not only to a better understanding of these compounds, but also to the understanding of the magnetic properties of transition group salts in general. It seems likely that further magnetic resonance research on the platinum group may also lead to new results of fundamental interest.

This work has been carried out by a group at the Clarendon Laboratory, Oxford. It is a pleasure for us to thank the Research Laboratories of Johnson, Matthey & Co., Limited, for their help and co-operation, and particularly to thank Dr. F. M. Lever and Mr. A. R. Powell.

A New Route to Acetaldehyde

A process for the direct oxidation of ethylene to acetaldehyde announced by the Consortium für Elektrochemische Industrie of Münich involves reacting a rising stream of ethylene-containing gas in a tower with a descending 0.1 M aqueous solution of palladium chloride:

$$C_2H_4+PdCl_2+H_2O \rightarrow CH_3CHO+Pd+2HCl$$

Liquid from the tower is passed to a still, where crude acetaldehyde is stripped off, while the spent palladium chloride is regenerated by air oxidation in another tower:

$$Pd+2HCl+\tfrac{1}{2}O_2 \rightarrow PdCl_2+H_2O$$

The advantages claimed for this process, which gives a 90 per cent yield, include low initial investment and the use of cheap raw materials. The same route could, it is thought, be employed economically to produce acetone from propylene and methyl ethyl ketone from normal butylene.