The compound consists of lemon yellow crystals having a melting point of 315 to 320°C. They are soluble in high boiling alcohols and chloroform.

$\{Ru_2Cl_3[(C_6H_5)_3P]_6\}^+Cl^-$

This is made by reacting $RuCl_3.3H_2O$ with an excess of triphenylphosphine in boiling methanol for twenty-four hours.

The compound consists of red-brown crystals having a melting point of 176 to 178°C. The crystals are sparingly soluble in alcohols but readily soluble in acetone, chloroform and benzene. The solutions rapidly change in colour from red to green when exposed to air and the compound is not recrystallisable.

$RhCl_3[(C_6H_5)_3P]_3$

This is made by reacting $RhCl_3.3H_2O$ with a large excess of triphenyl phosphine in ethanol. The solution is brought just to the boiling point and then allowed to cool.

The compound consists of orange red crystals having a melting point of 270 to 280°C. The crystals are soluble in alcohols and benzene, but attempts at recrystallisation result in loss of phosphine.

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Hydrogen Recovery by Palladium Diffusion

AN INEXPENSIVE LARGE-SCALE PROCESS

The big demand for pure hydrogen has encouraged Union Carbide Corporation to develop a large-scale hydrogen diffusion process using thin palladium films. Hydrogen 99.99 per cent pure is being produced at Corporation plants and the Olefins and Linde Divisions are prepared to manufacture units for sale elsewhere. The first nine plants will soon be operating, producing between them 34 million cubic feet of hydrogen per day.

R. B. McBride and D. L. McKinley have described these developments in a paper delivered at the 55th National Meeting of the American Institute of Chemical Engineers at Houston, Texas. Following experiments on the mechanisms of hydrogen diffusion through palladium, a pilot plant was built which operated satisfactorily from 1961 onwards.

Details were given of a 4 million cubic feet per day plant which uses a feed gas containing 50 per cent hydrogen. The diffuser operates at 350 to 400°C and produces hydrogen suitable for catalytic hydrogenation processes.

An important consideration is the availability of feed gases. The Union Carbide plant is designed for using off-gas streams from olefin plants and might also be used with coke oven gas or gas streams from oil refineries. Feed gases from such sources are low in cost and the reforming of other molecules to generate fresh hydrogen is obviated. Only hydrogen sulphide seriously poisons the palladium films and must be removed before the diffusion stage.

Factors which merit favourable consideration of diffusional recovery and purification of hydrogen include high pressure and concentration of feed gas, absence of contaminants, and a requirement for high purity hydrogen at low pressure.