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INDUSTRIAL SCALE PRODUCTION, PROPERTIES AND APPLICATIONS OF PERFLUOROCARBON LIQUIDS

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Perfluorocarbon liquids have been produced at I.S.C. Chemicals using the cobalt trifluoride fluorination process since the 1950's. The basic process, which was originally developed during the war as part of the Manhattan Project, has been improved over the years and the plant now has a capacity of over 100 tonnes/year.

A range of perfluorocarbons with boiling points between 29°C and 215°C is produced by fluorination of pentane, hexane, toluene, m-xylene, tetralin, methylnaphthalene, fluorene and phenanthrene. The crude products undergo extensive purification to ensure the removal of hydrogen-containing impurities.

These compounds are all dense, colourless, odourless liquids. They have great thermal and chemical stability and are essentially non-toxic. They also have excellent electrical insulating and heat transfer properties and are good solvents for gases.

The major uses of perfluorocarbons are in the electronics industry. One use is in vapour phase soldering, in which presoldered components are positioned on a circuit board which is lowered into the vapour of a boiling fluorocarbon (e.g. perfluoroperhydrophenanthrene; b.pt. 215°C) which melts the solder to form a joint. Other electronic uses include various testing procedures and cooling which involve direct immersion of an electrical device in a perfluorocarbon liquid.

The ability to dissolve gases has led to potential medical uses as oxygen carriers.

A small volume use is as taggants in atmospheric tracing.