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Xenon Forms Stable Compound with Fluorine

Xenon, as well as the other five members of the zero group of elements comprising the family of noble gases in the periodic table, was until recently accepted to be incapable of forming stable compounds with other elements. On the basis of a paper published in June 1962 reporting a chemical reaction of xenon with platinum hexafluoride vapor, it was decided to investigate the possibility of a direct reaction between xenon and fluorine.

The experiments show that xenon and fluorine combine readily at 400°C to form xenon tetrafluoride, XeF_4, which is a colorless, crystalline, chemically stable solid at room temperature. The process is conveniently carried out in a closed nickel vessel. The two gases, with the fluorine in moderate excess of the stoichiometrically equivalent amount, are passed into the vessel, which is then heated for approximately 25 minutes at 400°C. At the end of this time, the reaction product is rapidly cooled to room temperature. The excess fluorine gas is then pumped off while the reaction vessel is cooled to -78°C with dry ice. The xenon tetrafluoride crystals are recovered in high yield, essentially 100 percent with respect to the quantity of xenon used.

Notes:

1. This process can be used for the separation of xenon from mixtures with other noble gases, such as helium, argon, and krypton, which were found not to react with fluorine under the conditions of this process.
2. Further information concerning this process is given in "Fluorine Compounds of Xenon and Radon" by C. L. Chernick, et al, *Science*, 12 Oct. 1962, vol. 138, no. 3537; "Noble Gas Compounds", edited by Herbert H. Hyman, The University of Chicago Press, Chicago and London, The University of Toronto Press, Toronto 5, Canada, Library of Congress Catalog No. 63-20907; and U.S. Patent No. 3,183,061, available from U.S. Patent Office.
3. Inquiries may also be directed to:
   Office of Industrial Cooperation
   Argonne National Laboratory
   9700 S. Cass Avenue
   Argonne, Illinois 60439
   Reference: B66-10467

Patent status:

Inquiries about obtaining rights for commercial use of this innovation may be made to:

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