

SUBJECT - CHEMISTRY

CLASS - BSc(Hons) PART - I

PAPER - I

GROUP - B

TOPIC - CHEMISTRY OF XENON

Dr. Hasi Mohan Prasad Singh

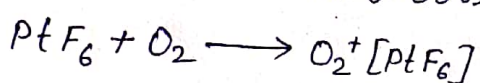
Department of Chemistry

Dr. L.K.V.D College Tarapur Saranastipur

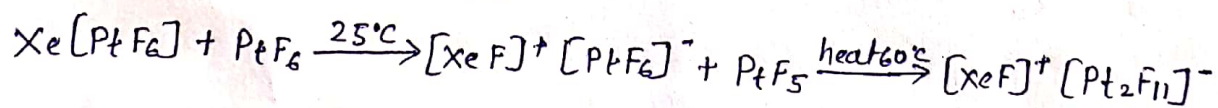
Page No - 01

Date - 29.04.20

The first real compound of the noble gases was made in 1962. Bartlett and Lohman had previously used the highly oxidizing compound platinum hexafluoride to oxidize dioxygen.



The first ionization energy for $\text{O}_2 \rightarrow \text{O}_2^+$ is 1165 kJ mol^{-1} , which is almost the same as the value of 1170 kJ mol^{-1} for $\text{Xe} \rightarrow \text{Xe}^+$ it was predicted that xenon should react with PtF_6 . Experiments showed that when deep red PtF_6 vapour was mixed with an equal volume of Xe, the gases combined immediately at room temperature to produce a yellow solid. They (incorrectly) thought the product obtained was Xenon hexafluoroplatinate(V), $\text{Xe}^+ [\text{PtF}_6^-]$. The reaction has since been shown to be more complicated, and the product is really $[\text{XeF}]^+ [\text{Pt}_2\text{F}_{11}]^-$.



Soon after this it was found that Xe and F_2 reacted at 400°C to give a colourless volatile solid XeF_4 . This has the same number of valency electrons as and is isostructural with the polyhalide ion $[\text{ICl}_4]^-$. Following these discoveries there was a rapid extension of the chemistry of the noble gases, and in particular of Xenon. The ionization energies of He, Ne and Ar are much higher than for Xe and are too high to allow the formation of similar compounds.

Structures of Some Xenon Compounds

Formula	Name	oxidation state	m.p (°C)	Structure
XeF_2	xenon difluoride	(+II)	129	Linear (RnF_2 and XeCl_2 are similar)
XeF_4	xenon tetrafluoride	(+IV)	117	Square planar (XeCl_4 is similar)
XeF_6	Xenon hexafluoride	(+VI)	49.6	distorted octahedron
XeO_3	Xenon trioxide	(+VI)	explodes	pyramidal (tetrahedral with one corner unoccupied)
XeO_2F_2		(+VI)	30.8	trigonal bipyramid (with one position unoccupied)
XeOF_4		(+VI)	-46	Square pyramidal (octahedral with one position unoccupied)
XeO_4	xenon tetroxide	(+VIII)	-35.9	tetrahedral
XeO_3F_2		(+VIII)	-54.1	trigonal bipyramid
$\text{Ba}_2[\text{XeO}_6]^{4-}$	barium perxenate	(+VIII)	dec. > 300	octahedral

Xe reacts directly only with F_2 . However, oxygen compounds can be obtained from the fluorides. There is some evidence for the existence of XeCl_2 and XeCl_4 and one compound is known with a Xe-N bond. Thus there is quite an extensive chemistry of Xe. The principal compounds are listed in Table.