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MAIN-GROUP DERIVATIVES OF THE HIGHLY ELECTRONEGATIVE $O{=}IF_4O$-GROUP

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The oxygen-bonded derivatives $FXeOIOF_4$ and $Xe(OIOF_4)_2$, including all isomers derived from cis-trans isomerism associated with the $O{=}IF_4O$-group, have been observed as the reaction products in IO_2F_3/XeF_2 solution mixtures by ^{19}F and ^{129}Xe NMR spectroscopy. The ^{129}Xe chemical shifts have been used to establish that the $O{=}IF_4O$-group is the most electronegative group known next to fluorine. In addition, the Xe(IV) derivative $F_3XeOIOF_4$, has also been characterized in solution.

Generally, the isolation of $O{=}IF_4O$-derivatives may not be accomplished by routes analogous to those used in the syntheses of $-OTeF_5$ derivatives. For example, direct reaction of $HOIOF_4$ and XeF_2 may lead to violent detonations which arise from the formation of the shock-sensitive hypofluorite, $FOIOF_4$. The formation of $FOIOF_4$ is circumvented by avoiding the use of fluoride precursors. Thus, it is possible to synthesize and isolate cis,cis-$Xe(OIOF_4)_2$ by displacement of volatile $HOTeF_5$ from $Xe(OTeF_5)_2$ by reaction with a stoichiometric amount of the strong protonic acid $HOIOF_4$. The solid state low-temperature Raman spectrum as well as the ^{19}F and ^{129}Xe NMR spectra are consistent with the proposed cis,cis-structure.