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AEROSOL DIRECT FLUORINATION, THE STATE OF THE ART

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The Aerosol Direct Fluorination process is an exceptionally clean method for the direct fluorination synthesis of perfluorinated organic molecules. The method is exceptionally useful for the synthesis of ether-like molecules having a very high oxygen to carbon ratio. Molecules which are unavailable by other synthetic methods because of their sensitivity to acidic conditions may be synthesized with little difficulty due to the rapid removal of endogenous hydrogen fluoride. Structural rearrangements which plague methods with high Lewis acidity are not observed in the aerosol process due to the strongly basic alkali fluoride aerosol which serves as a condensation nucleus for the organic molecule and which appears to have significant catalytic activity as well. Rearrangements which do occur can usually be rationalized by established organic free radical chemistry. Residual hydrogen atoms which remain on molecules can usually be explained by steric protection by previously fluorinated structural features. The selectivity of fluorine for specific reactive sites is of increasing interest. At the perfluorination end of the substitution reaction, protection of sites from reaction during direct fluorination is important in preserving site reactivity on generally unreactive molecules. The chemical reactivity at these protected sites will be discussed.

The stability of many functional groups during aerosol fluorination has proven the utility of elemental fluorine in organic synthesis of highly fluorinated, functional molecules.