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FLUORINATED RETINALS AND THEIR VISUAL PIGMENT ANALOGUES

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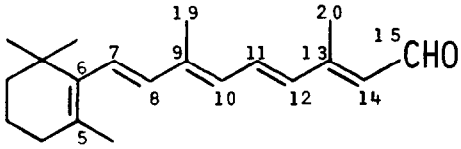
Retinals (I) with fluorine substituents at carbon 10, 12, 14, 19 and/or 20 have been synthesized and their goemetric isomers isolated. In several cases the fluorine substituents seem to have a profound effect on the conformational properties of the polyene chain as reflected in the spectroscopic properties (^{1}H-nmr and uv-vis) and their interaction with the protein opsin. These results will be analyzed in detail.



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PHOTOCHEMICAL PERFLUOROALKYLATION OF IMIDAZOLES

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Imidazoles with simple C- or N-substituents undergo facile photoperfluoroalkylation with perfluoroalkyl iodides, attack occurring preferentially at C-4 (or 5) [H. Kimoto, S. Fujii and L. A. Cohen, J. Org. Chem., in press]. Comparable results have now been obtained with more complex imidazoles: thus, N-acetylhistamine gives 47% of the 4-CF_3, 26% of the 2-CF_3 and 12% of the bis-2,4-CF_3 derivatives, the products being readily separated by silica gel chromatography; a similar distribution is obtained with α-N-acylated histidine esters. The latter compounds are being used to synthesize trifluoromethyl analogues of histidine-containing peptide hormones. The electrophilic trifluoromethyl radical shows a high degree of selectivity: phenyl-, methoxyphenyl- and pyridyl-imidazoles are substituted almost exclusively in the imidazole ring in high yield.

Both the 2- and 4-CF_3-imidazoles eliminate hydrogen fluoride above pH 8 to give very reactive difluorodiazafulvenes, which intermediates have potential for protein affinity labeling. Toward this end, we have investigated the electronic effects of other ring substituents on the rate constants for diazafulvene formation. At least for 2-CF_3-imidazoles, a plot of log k vs σ^+ is linear with $\rho \simeq -3$. Thus, at 30 °C, values of $t_{1/2}$ for hydrogen fluoride elimination range from 2.6 min for 4,5-dimethyl-2-CF_3-imidazole to 29 days for 4-nitro-5-methyl-2-CF_3-imidazole. The most reactive compound observed, to date, is 2,5-dimethyl-4-CF_3-imidazole with $t_{1/2}$ = 13 sec.