

ALPHA-FLUORONITROALKENES: USEFUL BUILDING BLOCKS FOR THE CONSTRUCTION OF NOVEL FLUORINATED HETEROCYCLES

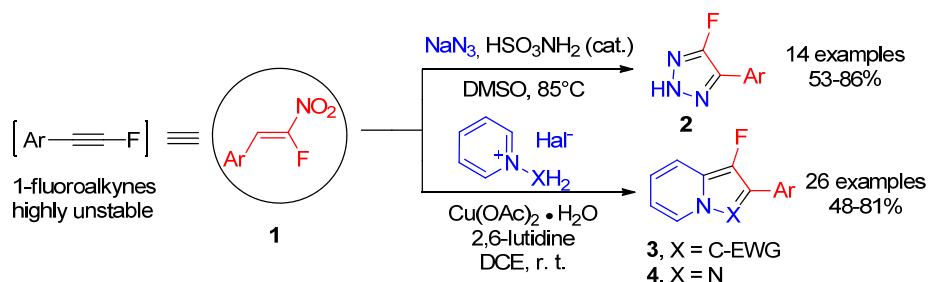
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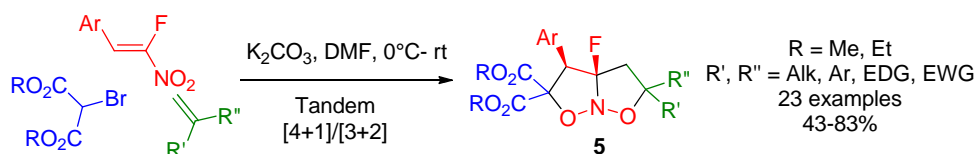
Fluorine-containing molecules are widely used as important pharmaceuticals and agrochemicals. Among them fluorinated heterocycles are the compounds of special interest, possessing different types of biological activity.^[1]

We have reported the efficient method for the two-step synthesis of α -fluoronitroalkenes from aromatic aldehydes.^[2] In the present work a number of routes to previously inaccessible fluorinated heterocycles from fluoronitroalkenes was developed.

First, the reactivity of α -fluoronitroalkenes in [3+2]-cycloadditions as 2π -components was studied. While synthesis of different fluorinated heterocycles via [3+2]-cycloaddition was limited due to extreme instability of 1-fluoroalkynes,^[3] α -fluoronitroalkenes **1** were found to act as their suitable synthetic equivalents. Thus, a route to previously inaccessible 4-fluoro-1,2,3-NH-triazoles **2** by cycloaddition with sodium azide was developed. Sulfamic acid was found to be the optimal catalyst for this transformation. Oxidative [3+2]-annulation of α -fluoronitroalkenes with pyridinium ylides and imines mediated by copper (II) acetate provides a direct route to novel fluorinated indolizines **3** and pyrazolo[1,5-a]pyridines **4**.



Next, the reactivity of nitroalkenes as 4π -components was explored. The one-pot reaction of α -fluoronitroalkenes, bromomalonate and different dipolarophiles in basic conditions resulted in formation of bicyclic 5,5-annulated nitroso acetals **5**. The mechanism involving tandem [4+1]/[3+2]-cycloaddition was discussed. Nitroso acetals formed with complete regioselectivity and high diastereoselectivity, and both electron-rich and electron-deficient dipolarophiles were suitable substrates for cycloaddition.



This work was supported by the Russian Foundation for Basic Research (grant № 18-03-00810).

[1] Fluorine in Heterocyclic Chemistry, Vols. 1-2, Ed. V. G. Nenajdenko, Springer International Publishing: Switzerland, **2014**.

[2] V. A. Motornov, V. M. Muzalevskiy, A. A. Tabolin, R. A. Novikov, Yu. V. Nelyubina, V. G. Nenajdenko, S. L. Ioffe, *J. Org. Chem.* **2017**, 82, 5274-5284.

[3] H. G. Viehe, R. Merenyi, J. F. M. Oth, P. Valange, *Angew. Chem., Int. Ed.*, **1964**, 3, 746-746.