

Summary of PhD thesis. „Investigation on synthesis and properties of *N*-aryl-*C*-nitroazoles”

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The subject of the thesis was synthesis and physicochemical characterization of *N*-aryl-*C*-nitroazoles.

The first part aimed at the synthesis of a series of structurally distinct *N*-aryl derivatives of *C*-nitro-*NH*-azoles. This task was achieved by several reactions. The first and the most general approach was coupling of the *C*-nitro-*NH*-azoles with arylboronic acids. Described methodology allows to obtain series of *N*-aryl-*C*-nitroazoles diversified in terms of location and nature of the substituent on the benzene ring as well as the structurally different *C*-nitroazoles. The influence of the substrate structure on reaction yields was investigated. The formation of regioisomers was not observed in any case. However, during reactions of substituted arylboronic acids with 3-nitro-1,2,4-triazole apart from the desired product second compound, being probably the product of the substitution of the nitro group with a methoxy anion, was formed. Selected *N*-aryl-*C*-nitroazoles were also prepared by coupling of *C*-nitro-*NH*-azoles with diaryliodonium salt or organic salts of boronic acid. The results indicate the potential use of these compounds in the synthesis of *N*-aryl-*C*-nitroazoles. 1-aryl-4-nitro-1,2,3-triazoles were obtained in cycloaddition reaction of aromatic azides with *N*-(2-nitroethenyl) morpholine. The analysis of HOMO and LUMO orbitals in substrates indicated that the structure of the obtained product is a result of the effective overlap of orbitals according to their size, regardless the dominant interaction of orbital, leading in each case to receive only the isomer of 4-nitro-1,2,3-triazole. 1-Aryl-4-nitroimidazoles were obtained by the known, selective and efficient *ANRORC* reaction. The structure of the obtained *N*-aryl-*C*-nitroazoles was confirmed by NMR studies using such techniques as HSQC, HMBC, NOESY, and confirmed by elemental analysis, mass spectrometry and X-ray diffraction analysis.

The second part of the study was concentrated on some physicochemical properties of the obtained compounds, important for evaluation of their potential applicability as biologically active species. The first investigated parameter was the partition coefficient logP. It has been found that the value of R_{MW} , determined by RP-TLC correlates well with the results of "shake flask" analysis. The study also examined the logP values calculated by computer programs, and for each of the classes of compounds the selection of programs with the best prediction has been proposed. Electrochemical studies using cyclic voltammetry and EPR spectra analysis showed that the *N*-aryl-*C*-nitroazoles undergo one-electron reduction to form the radical-anion. For investigated compounds the characteristic of redox couples were described. Within each group of compounds the redox potentials can be correlated with the values of the Hammett constant of substituent on the benzene ring and values of LUMO orbital energy.

Considering results of biological test available in literature and analysis undertaken within the frame of the thesis, the selection of compounds for further biological studies was proposed.