Summary of doctoral thesis

Title *„Allyl compounds in the synthesis of trisubstituted isoxazolines”*

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Isoxazolines (4,5-dihydroisoxazoles) are among the most important five-membered heterocycles in organic chemistry. They are used as substrates for the synthesis of compounds such as: β-amino acids, β-hydroxyketones, γ-amino alcohols, β-lactams, isoxazoles. The fragment of the isoxazoline ring is part of the structure of many biologically active compounds that exhibit antifungal, antibacterial and anticancer properties.

This dissertation is dedicated to the preparation of a series of new 3,4,5-trisubstituted isoxazolines from available and easy to synthesize allylic substrates by combining the following sequences of reactions: isomerization - 1,3-dipolar cycloaddition; homometathesis - 1,3-dipolar cycloaddition; homometathesis - isomerization - 1,3-dipolar cycloaddition; isomerization - homometathesis - 1,3-dipolar cycloaddition. Moreover, the 1,3-dipolar cycloaddition reactions with sterically crowded reagents were carried out under high pressure conditions - 1.2 (± 0.2) GPa, which allowed to shorten the reaction time and significantly increase the yield of isoxazolines preparation. The obtained results are one of the first proofs of the effectiveness of the use of high pressure for the synthesis of 3,4,5-trisubstituted isoxazolines. The presented strategy for obtaining isoxazolines is completely innovative, as confirmed by 4 granted patents. The paper also discusses the attempts to synthesize isoxazoles by aromatization of isoxazoline derivatives with the use of various dehydrogenation systems. Additionally, selected 3,4,5-trisubstituted isoxazolines were tested for antifungal and antibacterial activities; some of them showed high activity that encourages further research.

All obtained 3,4,5-trisubstituted isoxazolines are new compounds, which have been characterized using the following spectroscopic methods: ^{1}H and ^{13}C NMR, IR and mass spectrometry (HRMS). The structures of several compounds were additionally confirmed by X-ray structural analysis.