PEER REVIEW

“Chemistry of benzopyrones: coumarins, isocoumarins”

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The study of natural compounds and their synthetic analogs is an essential practically-oriented research spanning multiple dimensions: finding and isolating new substances from plant raw materials, establishing their structure, studying their chemical and biological properties, spectral characteristics, etc. Such research plays a crucial role in deepening our knowledge of biologically active compounds and provides the basis for creating and developing drugs with a broad spectrum of action.

The chemistry of natural and synthetic oxygen-containing compounds has established itself as a traditional research area at the Department of Organic Chemistry of Chemical Faculty of the Taras Shevchenko National University of Kyiv. The presented monograph is dedicated to the 130th anniversary of the Department of Organic Chemistry and covers the current state of the chemistry of coumarins and isocoumarins.

In the monograph "Chemistry of benzopyrones: coumarins, isocoumarins", the authors detail the classical aspects of the coumarin and isocoumarin chemistry together with the latest advances in their synthesis and modification, consider the present state of the research space, and provide a significant number of references both on original papers and other related reviews.

The monograph consists of seven sections covering the methods of synthesis and properties of 3-het(aryl)coumarins, 4-(het)arylcoumarins, 3-aryl(hetaryl)isocoumarins, and amino acid derivatives of coumarins, isocoumarins and 3,4-dihydroisocoumarins.

The first section of the monograph provides a brief overview of the major approaches to the synthesis of 3-hetarylcoumarins, based on the methods of annealing the coumarin system to the heterocyclic fragment or creating a heterocyclic substituent in the coumarin cycle. The second section deals with the synthesis of 4-arylcoumarins and covers cyclization methods (Pechmann, Perkin, Ponndorf reactions, etc.) and arylation methods of both inactivated coumarins and coumarins activated at the 4th position. The third section summarizes the methods of synthesis of 3-arylisocoumarins and 3-hetarylisocoumarins. The monograph provides an overview of the data on the interaction of coumarins with sulfur-containing nucleophiles (thionation reactions) and nitrogen-containing nucleophilic reagents (Section 4), and reviews the transformation of 3- (het)arylisocoumarins under the action of H-, N-, O-, S-nucleophilic reagents (Section 5). Section 6 discusses synthetic approaches to coumarin derivatives with amino acid or peptide fragments. Finally, Section 7 is devoted to advances in the field of amino acid derivatives of isocoumarins and 3,4-dihydroisocoumarins of natural origin. It is noteworthy that, in addition to methods for benzopyranone system construction, the final Sections describe efficient methods for introducing amino acids and oligopeptides using both classical approaches and novel reagents for peptide synthesis.

The monograph will be of interest to students, graduate students, and researchers interested in biologically active compounds and can feature as additional literature in the educational process for disciplines related to the chemistry of heterocyclic compounds.

The monograph was published in the publishing and printing center "Kyiv University" in 2021 and posted on the website of the Department of Organic Chemistry of Taras Shevchenko National University of Kyiv: https://orgchem.knu.ua/upload/metod_chemistry_of_flavonoids_coumarines_isocoumarines.pdf

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