

REVIEW

scientific adviser for dissertation work

Amankulova Dinara Erkinovna: "Development of a method for the non-catalytic synthesis of *meta*-aryloxy phenols from 1,3-cyclohexanedione", submitted for the degree of Doctor of Philosophy in the specialty "8D07105 - Chemical Technology of Organic Substances"

The dissertation research conducted by Amankulova D.E. focuses on developing a new method for synthesizing *meta*-(aryloxy)phenols from 1,3-cyclohexanedione. *Meta*-(aryloxy)phenols serve as intermediates in the synthesis of compounds with versatile activities, such as pharmaceuticals, agrochemicals, and dyes. Traditional methods for synthesizing *meta*-(aryloxy)phenols require harsh conditions and can pose environmental issues. The relevance of this research lies in its execution under milder conditions without catalysts, using industrially available starting materials.

The literature review in this dissertation examines various methods for synthesizing *m*-aryloxyphenols. This section has been published in a peer-reviewed journal: Dinara Amankulova et al. "Recent advances in the synthesis and applications of *m*-aryloxy phenols," *Molecules* 2023, 28, 2657.

The experimental portion presents a universal method for synthesizing *m*-(aryloxy)phenols from cost-effective and easily obtainable starting materials. 3-Chlorocyclohex-2-en-1-one was synthesized as the initial synthon under mild conditions and with a high yield. This compound is an essential intermediate in various organic syntheses due to its unique structural characteristics. The chlorine atom in 3-chlorocyclohex-2-en-1-one makes it a convenient building block in organic synthesis, as it can undergo a variety of reactions, including nucleophilic substitution, reduction, and addition reactions.

As a result of nucleophilic substitution of phenol derivatives with 3-chlorocyclohex-2-en-1-one, *m*-(aryloxy)cyclohex-2-en-1-ones were synthesized. Next, a directing group, specifically a bromine atom, was introduced in the second position in 3-(aryloxy)cyclohex-2-en-1-one.

The final stage of the planned transformations is the aromatization of 2-bromo-3-(aryloxy)cyclohex-2-en-1-ones. In these reactions, 1,8-diazabicyclo[5.4.0]undec-7-ene was used, and the reaction was conducted in toluene under mild conditions (atmospheric pressure, room temperature). The target products, *m*-(aryloxy)phenols, were synthesized in high yields.

In this work, Amankulova D.E. developed convenient methods for preparing new *meta*-aryloxy phenols, which also serve as the foundation for synthesizing other types of compounds. She synthesized 18 previously undescribed, new compounds. Modern physicochemical analysis methods (IR, NMR spectroscopy, mass spectrometry) were utilized to identify compounds and determine the structure of new compounds.

It is worth noting that Amankulova D.E. completed this work during her doctoral studies, successfully finishing her planned work and achieving results of

scientific and practical interest. She has demonstrated herself to be a skilled and proactive experimenter with independent research capabilities.

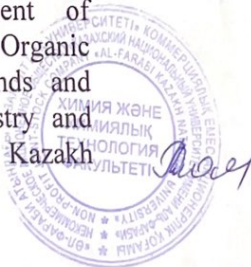
The work's results have been sufficiently published in three publications, including two manuscripts in international scientific journals (an article in the Tetrahedron journal with a Q2 rating, with a percentile of 60%, and an article in the Molecules journal with a Q2 rating, with a percentile of 83, and also were presented and discussed at the international conference of students and young scientists "Farabi Alemi - 2023". The work was awarded a diploma of the III degree.

The dissertation work, titled "Development of a method for the non-catalytic synthesis of *meta*-aryloxy phenols from 1,3-cyclohexanedione," in content and volume, fully meets the requirements for doctoral dissertations in the specialty "8D07105 - Chemical Technology of Organic Substances." The author of the work, Amankulova Dinara Erkinovna, is a well-prepared specialist for independent work and deserves to be awarded the required degree of Doctor of Philosophy in the specialty "8D07105 – Chemical Technology of Organic Substances." I recommend the work for defense.

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