

# REPORT

by

**Prof. Dr. Ing. Emilia Dimitrova Naydenova-UCTM, Sofia**

Member of the Academic Jury set to render a decision on the competition for filling the academic position of Associate Professor at the Faculty of Chemistry and Pharmacy, Sofia University "St. Kliment Ohridski" in the Professional Field 4.2. Chemical Sciences according to the Classifier of the Areas of Higher Education and the Professional Fields (Scientific Specialty " Organic chemistry - Chemistry of heterocyclic compounds ")

This Report is prepared in response to Order № ПД 38-9/07.01.2021 issued by the Rector of Sofia University, following the decision made by the Academic Jury that was held remotely (by e-mail on 15-17. 02 2021).

The Report is in compliance with *Development of Academic Staff in the Republic of Bulgaria Act (DASRB), the Rules for the Application of the Development of Academic Staff in the Republic of Bulgaria Act, the Rules of Sofia University "St. Kliment Ohridski", for applying the Act aforementioned.*

## **General overview of the procedure and the applicant**

The competition for filling the academic position of "Assoc. Professor" in the Professional Field 4.2. Chemical Sciences (Organic Chemistry - Chemistry of heterocyclic compounds) was announced in State Gazette, issue N:105 on 11. 12. 2020, for the needs of the Department of Organic Chemistry and Pharmacognosy, Faculty of Chemistry and Pharmacy, Sofia University "St. Kliment Ohridski".

Only one candidate participates in the competition – Nikola Tomov Burdzhiev, Ph.D.

The set of documents presented by Assist. Prof. Dr. N. Burdzhiev, is in accordance with the Rules for the Development of the Academic Staff at Sofia University "St. Kliment Ohridski" and meets the requirements for occupying the academic position of "Associate Professor".

## **General characteristics of the applicant's activities**

### **➤ Assessment of the scientific and research accomplishments of the candidate**

Assist. Prof. Dr. N. Burdzhiev has a total of 24 scientific publications in journals, referenced and indexed in global databases of scientific information (Web of Science and Scopus), of which 8 publications - Q1; 8 publications - Q2; 1 publication - Q3; 7 publications - Q4 and is a co-author of 3 textbooks.

In this competition he participates with a total of 19 scientific papers. At the time of submitting the documents 97 citations were noticed, the h factor is 7. He presented a habilitation thesis for the competition.

The publications are printed in scientific journals that are referenced and indexed in world-renowned scientific information databases, having impact factor, falling in quartiles from Q1 to Q4 according to the grouping of scientific journals.

**Indicator A1.** Dissertation for awarding the educational and scientific degree "doctor". The candidate Assist. Prof. Dr. N. Burdzhiev successfully defended his PhD thesis on "Polyfunctional piperidinones and pyrrolidinones - synthetic and chromatographic studies", (50 points).

The distribution of scientific papers according to the relevant Q factors is as follows:

**Indicator group C.4 - Habilitation work, scientific publications in journals that have been referenced and indexed in world-renowned scientific information databases (Web of Science and Scopus)**

With respect to this indicator, Assist. Prof. Dr. N. Burdzhiev has presented 6 publications of which 1 in Q1, 3 in Q2 and 2 in Q4. He is the first author in 2 of the publications and the second author in 3. In 4 of these publications, he has been stated as a corresponding author, which proves her significant contribution in the presented research. The points gained by this group are 109 (the required amount is 100 points). Based on the above stated, we can conclude that the criterion is unconditionally met.

**Indicator group D (D7).**

Regarding this indicator the candidate has submitted 13 publications, that have been referenced and indexed in Web of Science and Scopus. All works are in the field of the current contest and have been published in specialized international journals. They are grouped as follows: 3 publications in Q1 (*European Journal of Medicinal Chemistry*, *IF* (2018) = 4.833, *Forensic Science International*, *IF* (2019) = 2,108, *Comptes Rendus Chimie*, *IF* (2010) = 1,600), 4 publications in Q2 (*Journal of Drug Delivery Science and Technology*, *IF* (2019) = 2,734, *Beilstein Journal of Organic Chemistry*, *IF* (2019) = 2,622; *Chemical Papers*, *IF* (2019) = 1,680, etc.), 1 publication in Q3 and 5 publications in Q4. The points obtained in this group are 224 and in this case the criterion is fulfilled (required 220 points).

**Indicator group E.**

All the presented scientific papers are on meaningful topics and are at a high scientific level, which is proven by the number of citations. A total of 97 citations are observed, 54 of which were submitted in this competition, bringing 108 points in indicator E.11. As can be seen Assist. Prof. Dr. N. Burdzhiev fulfills the requirements of DASRB.

**Indicator group G.**

His h-index is 7. He has participated in the development of scientific projects and the points on this indicator are 115, which significantly exceeds the required 70 points.

Moreover, Assist. Prof. Dr. N. Burdzhiev has additional qualifications and several short-term specializations (one to two months) in renowned foreign universities: University of Oxford, Oxford, UK (2015); Max-Planck-Institut für Polymerforschung, Mainz, Germany (2018) and Universitat de Barcelona, Barcelona, Spain (2019). He was awarded the Badge of Honor of the Sofia University "St. Kliment Ohridski" Second degree, 2018.

In addition, Dr. N. Burdzhiev has participated in 15 scientific forums with posters or oral presentations.

- **Assessment of educational and pedagogical activity and training of the candidate (s)** (study aids, lectures, work with students, graduates, and doctoral students)

From 2010 until today he is the Chief Assistant in Organic Chemistry. During these years he established himself as a university lecturer. He has conducted both exercises and seminars and lectures for undergraduate students in the following disciplines: Organic Chemistry II / part-time education /; Structure and biological activity of organic compounds - for all chemical specialties; Chemistry of heterocyclic compounds - for all chemical specialties. Exercises in Modern Techniques in NMR Spectroscopy and practical exercises in the course Instrumental Methods for Analysis II. He has co-supervised 3 and supervised 6 successfully defended diploma theses.

➤ ***Contributions (scientific, applied science, applied)***

All scientific articles submitted in the competition are in the field of organic chemistry and chemistry of heterocyclic compounds. The scientific interests of Dr. Nikola Burdzhiev are focused on the synthesis and modification of heterocyclic compounds with potential application in practice and their identification and characterization with modern spectral methods and mainly with the help of NMR spectroscopy. The stereochemistry and mechanisms of the ongoing reactions have been studied.

Dr. Burdzhiev's research enriches the scientific knowledge in the field in which he works and offers original solutions with opportunities for practical application. The scientific and applied contributions of the presented works can be summarized in the following directions:

- *Synthesis of heterocyclic compounds by reactions of cyclic anhydrides and subsequent modifications in order to obtain compounds with potential biological activity;*
  - Oxopyrrolidine, oxopiperidine and oxomorpholine carboxylic acids are obtained by reaction of N-benzylidenebenzylamine with succinic, glutaric and diglycol anhydride.
  - The optimal reaction conditions have been established. The relative configuration of the obtained acids and its derivatives was determined by NMR spectroscopy.
  - (±) -Trans-1-benzyl-6-oxo-2-phenylpiperidine-3-carboxylic acid was used to prepare peptidomimetics with the potential to bind to the human neurokinin-1 receptor.
  - It has been found that the application of ultrasound in the preparation of aminomethylpiperidinones by the Mitsunobu reaction reduces the reaction time.
  - The resulting pseudo- and tri-peptides were tested for ACE inhibitory activity and two of the resulting compounds were found to be weak ACE inhibitors.
  - A direct approach has been found to obtain in one step the benzo [a] quinolizidine system and its bioisosteric O and S analogues. For this purpose, the interaction of cyclic imines with monocyclic anhydrides has been successfully used.
  - The use of succinic anhydride has been found to be a convenient one-step method for reaching the pyrrolo [2,1-a] isoquinoline heterocyclic system.
  - One-dimensional and two-dimensional NMR techniques and X-ray diffraction analysis was used to prove the structure of the obtained compounds.
- *Synthesis and spectral characterization of heterocyclic compounds with potential application in practice;*
  - Derivatives of 2-acetyl-1,3-indandione with 4- (1,4,7,10-tetraoxa-13-azacyclopentadecan-13-yl) benzaldehyde and 4-hydroxy-1-naphthaldehyde with 4- (1,4,7,10-tetraoxa-13-azacyclopentadecan-13-yl) aniline were synthesized for potential applications, such as new optical sensors and metal ion extraction reagents.
  - The influence of metal ions (K<sup>+</sup>, Na<sup>+</sup>, Mg<sup>2+</sup>, Sr<sup>2+</sup> and Ba<sup>2+</sup>) on the optical properties of a crown ether derivative of 1,3-indandione was studied.
  - A novel fast “green” method has been developed for the preparation of the squaraine dye by applying microwave irradiation.

- New complexes of Pd (II) and Pd (IV) with newly synthesized ligand 3'-amino-4-thio-1H-tetrahydropyranspiro-5'-hydantoin have been synthesized and characterized. Following *in vitro* tests for biological activity, it has been found that they exhibit concentration-dependent cytotoxicity on the studied human tumor cell lines.

• *Spectral properties of heterocycles used in practice.*

- The solubility of Itraconazole in colloidal aggregates of 16 surfactants and 3 mixtures of surfactants and phospholipids was studied. The parameters influencing the solubility are established.

- The conducted research provides useful information that can be used in practice when working with other poorly soluble drug molecules.

- Studies on “herbal mixtures” containing synthetic cannabinoid (5F-ADB) have shown that the combination of GC-MS with NMR is an effective tool for identifying known and unknown substances prohibited by law.

### Critical comments and recommendations

I find that the numbering of the publications is not done in the best way. Two lists of the candidate's publications are submitted, however, in each list, the same publication has a different number.

I think it's good to have one common folder with publication and in this folder each article to be placed as a separate PDF file. In the submitted documents the publications are in one file and this makes it extremely difficult to find a specific article.

### CONCLUSION

The documents and materials presented by Assist. Prof. Dr. N. Burdzhiev **meet all the requirements** of the DASRB, the Rules for the Application of the Development of Academic Staff in the Republic of Bulgaria Act, and the Rules set at the Sofia University "St. Kliment Ohridski", for applying the Act aforementioned.

The candidate has submitted a **sufficient** number of scientific papers published in renowned international specialized journals. The applicant's works have original scientific and applied contributions. Their high scientific level is evidenced by the number of citations from other authors. The scientific and pedagogical qualification of Assist. Prof. Dr. N. Burdzhiev is **undoubted**. The results achieved strongly demonstrate the applicant's competence and research experience. This gives me a reason to give my **positive assessment** and to recommend the Academic Jury to render a positive decision on Assist. Prof. Dr. N. Burdzhiev filling the position of **Associate Professor** in the professional field 4.2 "Chemical Sciences" (Organic Chemistry - Chemistry of heterocyclic compounds) at the Faculty of Chemistry and Pharmacy, Sofia University "St. Kliment Ohridski".

Date: 12.04.2021

Report prepared by:

/Prof. Dr. Emilia Naydenova/