



STATEMENT

by Assoc. Prof. Anna Atanasova Tomova, PhD
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of the materials submitted for participation in a competition for the academic position "Associate Professor", announced in State Newspaper No. 21/14.03.2025 for the needs of the Department „Biotechnology“, Laboratory „Bioremediation and Biofuels“ - The Stephan Angeloff Institute of Microbiology, BAS (IM-BAS).

In the Higher Education area 4. Natural Sciences, Mathematics and Informatics; Professional area 4.3. Biological Sciences; Scientific specialty Microbiology

By order № I-65 / 29.04.2025 of the Director of the Institute of Microbiology, BAS, I am included in the Scientific Jury to select an "Associate Professor" for the needs of the Department „Biotechnology“, Laboratory „Bioremediation and Biofuels“. The only candidate under the announced competition was Dr. Venelin Nejchev Hubenov, currently holding the position of Assistant Professor at the Department „Biotechnology“, Laboratory „Bioremediation and Biofuels“ - Institute of Microbiology, BAS. As a member of the scientific jury, I declare that I have no common scientific publications with the applicant.

Brief information about the career development of the applicant in the competition

Dr. Hubenov graduated with a Bachelor's degree in Biotechnology. In February 2007, he obtained a Master's degree with the qualification of Biotechnologist - Master of Ecological Biotechnology at Sofia University "St. Kliment Ohridski". He successfully defended his PhD thesis on "Anaerobic degradation of organic waste in mesophilic and thermophilic cultivation mode" in 2015 to obtain the educational and scientific degree "Doctor", IM-BAS.

His professional career began in 2007 as a biotechnologist at the "Prof. Dr. Asen Zlatarov" University in Burgas. Subsequently, he continued his academic development at the Institute of Microbiology at the Bulgarian Academy of Sciences, where he held the positions of assistant and chief assistant, and where he still works today. As a researcher, he has participated in eleven scientific projects – nine national and two international, and he leads four of them. The results of his research activities have been presented at 16 scientific conferences, of which 7 are international. As an expert, he has been conducting editorial work for the scientific journal Biotechnology and Biotechnology Equipment since 2023. He is a member of the following professional organisations: The Union of Scientists in Bulgaria (since 2010), „John Atanasoff“ Society of Automatics and Informatics (since 2011), National Society of Ecological Engineering and Environment Protection (since 2013), and The Bulgarian Astronautical Society (since 2021). His scientific and expert activities are combined with an administrative role as the secretary of the permanent Commission for the Protection of the

Description of the presented scientific papers and scientometric indicators

The set of materials provided includes all the necessary documents according to the Rules of the Institute of Microbiology for admission to participate in the competition

Table 1. Minimum national requirements for "Associate Professor" in Field 4: Natural Sciences, Mathematics and Informatics according to the Act for the Development of Academic Staff in the Republic of Bulgaria and the Regulations of BAS.

Group of Indicators	Content	Requirements for Associate Professor	Indicators of Assist. Prof. Dr. Venelin Hubenov
A	Indicator 1	50	50
B	Indicator 2	-	-
C	Indicators 3 и 4	100	107
D	Sum of Indicators from 5 to 9	220	236
E	Sum of Indicators from 10 to 12	60	195
F	Sum of Indicators from 13 to the end	-	-

Dr. Hubenov applied for the academic position of Associate Professor with 27 scientific publications, 17 of which are published in refereed and indexed journals with a total impact factor of 35.835 (excluding publications related to the PhD degree). Among these, five publications constitute the habilitation work, including three featured in Q1 journals. Concerning 'D' group of indicators, the submission comprises 12 peer-reviewed publications with an impact factor or SJR rating, along with one active registered utility model. The publications are distributed as follows: Six are in Q2 journals, three in Q3 journals, and two in Q4 journals. One publication is in a full-text conference proceedings and does not fall into a Q rank. Dr. Hubenov's scientific developments have been published in prestigious international journals such as Life, Processes, Applied Sciences, and Genes.

The 17 publications submitted for the competition have been cited 94 times in Scopus and 7 times in other data bases (excluding self-citations), corresponding to 195 points under indicator „E“ – significantly exceeding the required 50/60 points as specified in the Act for the Development of the Academic Staff in the Republic of Bulgaria and the Regulations of BAS. The materials provided by Dr. Hubenov confirm that he fully meets the national minimum requirements for holding the academic position of Associate Professor, surpassing the criteria in groups B, C and D.

Additional Criteria for the Position of Associate Professor at the Stephan Angeloff Institute of Microbiology – BAS.

The candidate meets the additional requirements set out in the Regulations of the IM-BAS. He has held the position of Chief Assistant Professor for four years. The publications presented as part of the habilitation work do not overlap with those submitted for the award of a PhD degree. In

six of the scientific publications, Dr. Hubenov is listed as the first author.

He exceeds the criteria in several key areas: a total of 126 citations in Scopus and 213 in Google Scholar (minimum requirement: 100), a total Impact factor of 35.835 (minimum: 20), an h-index of 6 in Scopus (minimum: 5), and participation in 11 scientific projects—9 national and 2 international—compared to the required minimum of 3.

Main Research Areas and Key Contributions

Dr. Hubenov's research focuses primarily on the processes of anaerobic degradation of organic materials, which are essential for the sustainable production of biogas, a valuable renewable energy source. By optimising anaerobic fermentation, the efficiency and yield of biogas can be improved, contributing to reduced dependence on fossil fuels and lower carbon dioxide emissions. Beyond its environmental benefits, anaerobic degradation supports the circular economy by transforming waste materials into useful resources. This has significant implications for waste management, agriculture, and industry.

In this context, one of Dr. Hubenov's research projects focuses on developing a technological solution for the pretreatment of lignocellulosic materials, aiming to utilise them as feedstock for anaerobic biodegradation. A significant contribution of this work is the demonstrated effectiveness of ultrasonic treatment, which enables high biogas yield with minimal energy input.

The second research direction, related to anaerobic degradation, focused on the development of two-stage biotechnological processes for hydrogen and methane production. Key applied contributions in this area include:

- The use of an immobilised microbial consortium for the degradation of wheat straw at 55°C, resulting in a 2.5-fold increase in hydrogen production;
- Investigation of the co-anaerobic degradation of agricultural plant and household waste aimed at optimising bioconversion processes;
- A two-stage process implementation for the degradation of corn extract, leading to a 40% higher energy yield compared to the conventional single-stage methane production process.

Anaerobic degradation is carried out by microbial communities under mesophilic and thermophilic conditions. Dr. Hubenov investigates the species diversity within such microbial consortia through metagenomic analysis, identifying the key taxa involved in lignocellulose breakdown. He demonstrates that hydrogen generation is primarily attributed to *Proteiniphilum saccharofermentans*, which is the most abundant species in the microbial community. Methane production, on the other hand, is mainly associated with several methanogenic archaea (*Methanobacterium formicicum*, *Methanosarcina spelaiei*, *Methanotherix soehngensis*, and *Methanobacterium beijingense*). In a two-reactor continuous stirred system used for the degradation of corn extract, it was shown that *Firmicutes* were the predominant bacterial phylum, with *Methanotherix* (8.03%) and *Methanosarcina* (3.39%) being the dominant methanogens.

In his research on thermophilic anaerobic degradation of lignocellulosic materials, Dr. Hubenov found that bacteria dominate over archaea. The predominant bacterial classes identified were *Clostridia* (32.9%), *Bacteroidia* (21.5%), and *Betaproteobacteria* (11.2%). Applied contributions include the development of a mixture composed of wheat straw and waste algal biomass (80:20 w/w), achieving high yields of hydrogen (42.5%) and methane (56.1%), as well as the identification of key taxa involved in acidogenesis (*Thermocaproicibacter melissae* [44.9%] and *Clostridium cellulosi*) and methanogenesis (*Bathyarchaeota* [99.5%] and *Methanobacterium formicicum*). It was also demonstrated that in an immobilised microbial consortium used in a

methane-producing bioreactor, archaea of the *Euryarchaeota* phylum were dominant, followed by members of *Proteobacteria* and *Bacteroidetes*, with lower representation of *Firmicutes* and *Actinobacteria*.

The search for sustainable solutions to address the global threat of climate change, driven by environmental pollution and the mismanagement of natural resources, requires key actions such as the transition to green energy, emission reduction, reforestation, and circular economy practices. In this context, Dr. Hubenov directs his research toward the valorisation of the liquid waste fraction—biosludge, as a cultivation medium for microalgal biomass production. A practical contribution of this research is the economically viable strategy development for cultivating microalgae on biosludge, aiming at biomass yield and product extraction with industrial applications.

Microbial biodegradation can be applied to waste valorisation during long-term space missions. Dr. Hubenov's research has led to the development of an anaerobic process for the biodegradation of cellulosic substrates similar to those used in astronaut personal hygiene materials, utilising non-pathogenic cellulose-degrading bacteria. A degradation rate of 72 % was achieved for cellulose under mesophilic conditions, as demonstrated in terrestrial experiments.

One of the candidate's key research areas focuses on the development and evaluation of the antimicrobial properties of nanocomposite films based on biodegradable polylactic acid (PLA) and a PLA/polyvinylpyrrolidone (PVP) blend, modified with stabilized hydrosincite. Additionally, electrospun fibers containing green-synthesized hydrosincite (GHZ) emulsion were analyzed. The resulting biocomposites exhibited significant antibacterial activity against *E. coli*, with nanocomposite films showing superior antimicrobial effectiveness.

CONCLUSION

Based on the analysis of the content and quality of the materials submitted for the competition, I consider that the candidate, Chief Assistant Professor Dr. Venelin Hubenov, exceeds the quantitative criteria for the academic position of Associate Professor, as established by the ZRASRB, the Regulations of the Bulgarian Academy of Sciences, and those of the Stephan Angeloff Institute of Microbiology. His research activity contributes significantly to the study of microbial anaerobic degradation and its application in waste materials utilisation. Furthermore, his work is accompanied by active involvement in editorial and publishing activities, highlighting his professionalism and commitment to scientific advancement. In light of the above, I fully support his candidacy and recommend that the members of the Scientific jury propose to the Scientific Council of the Institute of Microbiology that Dr. Venelin Hubenov be appointed as Associate Professor in the professional field 4.3. Biological Sciences, specialty Microbiology.

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Prepared by:

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