

## REVIEW



*of the documents presented for participation in the professional competition for academic position “professor” in professional direction 4. 2. Chemical Science (Processes and apparatus in chemical and biochemical technology) requested by Laboratory “Transfer processes in multiphase media” – Institute of Chemical Technology, Bulgarian Academy of Sciences with candidate Assoc. Prof. Dr. Maxim Ivanov Boyanov*

**Reviewer: Prof. Dr. Vasil Simeonov, DSc, Faculty of Chemistry and Pharmacy, University of Sofia “St. Kl. Okhridski”**

### *Short biographic data for the candidate*

Assoc. Prof. Dr. Maxim Ivanov Boyanov was born in Sofia, Bulgaria in 1973. He completed his secondary education at 1<sup>st</sup> English language school in Sofia, Bulgaria and at secondary school “M. Curie” in Chicago, Illinois, USA in 1990. He starts his high education in physics at Illinois Technological Institute, Chicago, USA in 1990 and completes it in 1995 at Faculty of Physics, University of Sofia as master of physics (solid state physics) with excellent marks. In the period 1995 – 1996 he serves compulsory military training at Bulgarian army unit and begins preparation of his PhD thesis at Notre Dam University, Indiana, USA where he defends his thesis in the field of X-ray spectroscopy in 2003. Afterwards he has been twice as postdoc fellow at Institute of ecological research at Argon Laboratory, Illinois (2003-2006) and at Institute of molecular ecology, Notre Dam University, Indiana, USA (2006 – 2007). After short stay in Bulgaria working as a physicist and assistant professor at Faculty of Physics and Faculty of Chemistry, University of Sofia, M. Boyanov takes the position of physicist at Institute of biology, National Argon Laboratory, Illinois, USA (2008 – 2014).

Since February 2014 up to now M. Boyanov works at Institute of Chemical Technology, Bulgarian Academy of Sciences, first as assistant professor and later as associated professor.

Assoc. Prof. Dr. Maxim Boyanov is married with two children.

### *Scientometric indicators for the publications presented*

For the present procedure M. Boyanov presents to the attention of the reviewer 25 scientific publications in different science journals and one chapter from a monograph. The scientometric analysis is facilitated by the detailed description presented by the candidate – list of all publications with bibliographic details, impact factors and quartiles of the respective journal as well as direct link to the full text of the manuscript.

All publications included (totally 26) are published in journals with impact factors varying from 30.067 (*Energy and Environmental Science*) through other significant values през други значителни стойности (10.652 for *Chemical Engineering Journal* or 9.028 for *Environmental Science & Technology*) down to more modest values for *Journal of Environmental Management* or *Applied Geochemistry* with impact factors 2.635 and 3.088, respectively). No doubt that the scientific quality of the journals where M. Boyanov has published his works is very high. It is confirmed by the values of the respective quartiles as scientometric estimates – dominantly Q1 (17 out of totally 25 publications in journals).

Assoc. Prof. M. Boyanov has a significant number of co-authors in all of presented studies. I personally support the opinion that all co-authors are in equal position in creating the publication, although there are other opinions that the arrangement of the author names in the list of authors is indication about the contribution of each one of them in the common study. There is another interpretation – the authors with higher academic position are dislocated at the end of the author list. I support the idea about equal treatment of all participating authors. The modern science (both theoretical and applied) needs cooperation due to the complex nature of the investigations and the participation of many co-workers is rather advantage than disadvantage, especially when dealing with biophysics, biochemistry or environmental sciences. For the sake of statistics M. Boyanov is first author in totally 11 out of all 26 presented studies, which is a good indicator for his contributions.

It is worth to note that assoc. prof. M. Boyanov is author of totally 80 articles (during his period of scientific activity) as 72 of them are published in journals with impact factor. They are cited over 4000 times. The citations within the frame of the present competition are 1007 (without self citations). The other important indicator related to the citation activity is the h-

index (value of 34 for M. Boyanov's scientometrics, being an impressive value for Bulgarian scientist).

To the general scientometric assessment several additional informations should be added:

- Participation with reports (for the present procedure totally 144, for the whole period of activity – 239) at conferences, seminars and congresses;
- Leadership and participation in projects – totally 7 projects in Bulgaria and abroad with adoption of over half a million leva for the needs of the Institute of chemical technology;
- Tutorship of two PhD students and one postdoc fellow;
- Teaching activity at Faculty of Physics, University of Sofia;
- Reviewer of submitted for publication manuscripts (totally 49 journals);
- Membership in scientific societies and editorial staff of scientific journals.

In conclusion, it could be stated that from scientometric point of view the scientific activity and production of the candidate not only correspond to the recommended requirements of the Institute of chemical technology, Bulgarian Academy of Sciences, but significantly exceed them both formally (as digital results) and meaningfully (level of journals used for publication, number of citations, presentation at international scientific forums, participation in scientific projects etc).

#### *Scientific contributions*

The scientific activity of M. Boyanov covers a significant time period and is illustrated by a large number of scientific publications most of which were already scientometrically analyzed. For a complete assessment of the scientific contributions all published studies have to be considered – those completed before the application to the present procedure, and those included for consideration in this procedure for full professorship. Here, an attempt will be made to summarize the principal contributions related to all publications of M. Boyanov:

1. Clarification of the reaction mechanisms in environmental objects and in laboratory conditions, related mainly to processes on boundary surface solvent/mineral component or solvent/biological component. It may be stated that



similar studies are subject to the scientific trend “molecular biogeochemistry” being a typical interdisciplinary issue. Various technological methods for purification of soils and natural waters have been developed and the studies lead to creation of adequate models of transfer in real environmental objects (underground waters). M. Boyanov presents original information about the interactions on molecular level between dissolved ions in contact with different surfaces. Contribution in this section of studies, which could be conditionally named “ecological”, is the elucidation of the role of the factors, related to formation of nanoparticles and minerals, and the impact of the redox processes linked to the environmental pollution.

2. The specific information about interactions on molecular level in environmental objects helps for explanation of macroscopic data, for model calibration in order to ensure relation of molecular structure data from quantum chemical calculations with thermodynamic models for calculation of equilibrium concentrations with observed macroscopic concentrations. I consider these as contributions in this conditional “QSAR sector of the molecular biogeochemistry”. The studies in these two contribution sectors (1 and 2) are published in very prestigious journals and have received a large number of citations.
3. The third contribution section in the works of M. Boyanov could be conditionally named “methodical”. The candidate possesses significant practical experience in the field of synchrotron X-ray spectroscopy and, thus, is prepared to meet any kind of methodological challenge, related to the necessity of experimental measurements in molecular biogeochemistry. It opens various options for participation in different international science projects as well as for preparation of students, Ph students and young researchers in the field of synchrotron X-ray spectroscopy.

### *Questions and comments*

It has to be mentioned that the documents presented by M. Boyanov are excellently ordered and it is easy to deal with them. I have some minor questions and comments (mainly concerning the self esteem of the contributions of the candidate). These are based not so much

on errors or missing elements, but on some individual opinions of the reviewer, who was engaged for many years with issues of analytical chemistry, chemometrics and environmetrics (application of multivariate statistical methods for interpretation, classification and modeling of analytical monitoring data sets from pollution events in environmental compartments like waters, air, soils, indoor[ pollution and health issues):

1. Does it seem possible for the candidate to reach conclusions about identification of pollution sources of the environmental objects studies using approaches from the molecular biogeochemistry like type of transfer phenomena, specific reactions at boundary surface etc?
2. Would it be possible the theoretical models of interaction to give an answer to the important question which descriptor participating in a model is responsible to highest extent for the behavior of a certain environmental object – similarity to another ecological effect, time (seasonal) dependencies, geographic similarity etc?
3. In the document for self estimation of the contributions I found an expression “titration of pH”, which seems to me to be incorrect; from analytical point of view is accepted to use the term “acid – base titration” or “neutralization analysis”. In the same document one could find several expressions dealing with pH values but according to me it is more correct to use “acidic, basic or neutral *medium*”.
4. In the newest analytical terminology is accepted to speak of Fe (II) or Fe (III) compounds and complexes, not of „ferrous,, and „ferric-”forms.

### *Conclusion*

After reviewing the documents for application of Maxim Boyanov to the academic position “full professor” at Institute of Chemical Technology, BAS, I conclude that the candidate covers completely the requirements of the Law for development of the academic staff in Republic of Bulgaria and the Guide for application of the Law developed by the Institute of Chemical Technology.

I do not know personally Assoc. Prof. Dr. Maxim Boyanov, but reviewing his scientific activity I came to the conviction that he is a high level scientist with rich experience as researcher able to define and solve scientific problems and to work jointly in large scientific

teams. Till now his personal circumstances determined these teams to be composed of scientists from USA but I am convinced that he is searching for Bulgarian colleagues to develop tasks and problems for new specific studies.

In conclusion I can declare that my vote for assessing the academic position “full professor” to Assoc. Prof. Dr. Maxim Ivanov Boyanov (professional direction 4.2 Chemical Sciences, Processes and apparatus in chemical and biochemical technology) requested by the Laboratory of chemical technology (Laboratory of Transfer processes in multiphase media) is **definitively positive**.

Sofia, 28/11/2022

Reviewer:



Prof. Dr. V. Simeonov, DSc