

REPORT

from prof. Elena Razkazova, Ph. D

On the competition for the academic position " Professor "
in professional field 4.2. Chemical sciences, specialty "Processes and apparatus in chemical
and biochemical technology", for laboratory "Innovative Processes and Systems
Engineering" at IChE-BAS, with single candidate Assoc. prof. eng. Elisaveta Georgieva
Kirilova (Shopova)

1. Brief biographical information and an overview of the candidate's scientific interests.

Associate Professor Dr. Elisaveta Georgieva Kirilova (Shopova) was born in Sofia. In 2000, she graduated as a Master of Chemical Engineering from the University of Chemical Technology and Metallurgy, Sofia, Bulgaria, and she developed and defended her master's thesis on "The Influence of Vibration on the Properties of Titanium Dioxide Flow" at Otto von Guericke University, Magdeburg, Germany, through the Erasmus program.

She joined the Institute of Chemical Engineering at the Bulgarian Academy of Sciences in 2001, where she gradually moved up through the positions of research associate (2001-2011), senior assistant (2011-2018), and associate professor (2018 to present). In 2011, she defended her PhD thesis on the topic "System-Oriented Approach to Environmentally Friendly Management of Multi-Purpose Chemical and/or Biochemical Production Systems" and earned a Ph. D. degree.

Since 2018, she has been the head of the 'Innovative Processes and Systems Engineering' laboratory at IChE-BAS, and since 2022 she has been the Scientific secretary of the Institute. Associate Professor Elisaveta Kirilova, Ph. D is the recipient of the National UNESCO-L'Oréal Award 'For Women in Science' for young female researchers under 35 (2011) and the 'Marin Drinov' Award for Young Scientist of BAS (2013) in the field of 'Energy Resources and Energy Efficiency.'

She has conducted two specializations at the University of Limerick, Ireland, in the Department of Chemical and Environmental Science, namely in July 2011 and April-May 2013.

She is a member of the Union of Chemists in Bulgaria and the Bulgarian Society for Chemical Engineering, as well as three COST actions under Horizon 2020.

Assoc. Prof. Dr. Elisaveta Kirilova has participated in 7 organizational and scientific committees of national and international scientific forums. She speaks English, German, and Russian.

Her scientific skills, experience, and interests can generally be summarized as in the field of optimal design of sustainable resource-supply chains and analytical modeling of multilayer nanocomposite structures.

2. General overview of the candidate's research and applied scientific activities.

The candidate's scientific interests and contributions can be summarized in the following 4 thematic groups:

1. Improving the resilience and energy efficiency of production systems with periodic processes, using conventional industrial wastewater treatment systems that apply the autothermal thermophilic aerobic digestion (ATAD) process for sludge.
2. Optimal design of sustainable resource-supply chains for the production and distribution of biofuels using various bioresources;
3. Optimal design of sustainable resource-supply chains for the production and distribution of dairy products;

4. Mechanical behavior and delamination of layered nanocomposites - analytical methods and optimization.

The total number of the candidate's scientific publications is 96, of which 61 have an impact factor (ISI IF) and/or impact rank (SJR), and the total number of all citations is 594. The h-index (according to Scopus) is 8, and the number of participations in national and international conferences is 114.

Assoc. Prof. Dr. Elisaveta Kirilova is the leader of one international project, and is a member of the team of 10 international projects funded by various sources (inter-academic cooperation between the Bulgarian Academy of Sciences and the University of Veszprém, Hungary – 3 projects, DFG – 6 projects, NSF – IX Session of the Joint Bulgarian-Spanish Commission for Scientific and Technical Cooperation between Spain and Bulgaria). She is the leader of 2 projects and a participant in 5 projects funded by the National Scientific Fund.

3. General description of the submitted materials.

Assoc. Prof. Dr. Elisaveta Georgieva Kirilova is the only candidate in the competition for the academic position of "Professor" and has submitted all the necessary documents according to the Regulations on the Conditions and Procedures for Holding Academic Positions at BAS and the Regulations for the Application of the Law on the Development of Academic Staff in the Republic of Bulgaria.

Meeting the minimum national requirements for candidates for the Academic Position "Professor" by groups of indicators is as follows:

Indicator A - 50 points (out of min 50 points.)

Dissertation for awarding the educational and scientific degree "Ph.D".

Indicators B - 170 points (from min 100 points)

Habilitation Thesis - scientific publications in journals that are peer-reviewed and indexed in internationally recognized scientific databases (Web of Science and Scopus) - Articles in journals ranked Q1 – 6 pieces and 1 piece in Q2;

Indicators G - 282 points (from min 220 points.)

Scientific publications in journals that are peer-reviewed and indexed in world-renowned scientific databases (Web of Science and Scopus), apart from the habilitation thesis – 18 articles in journals falling into quartiles Q3 (12) and Q4 (6) and chapters in books in international editions – 2 items;

Indicators D - 418 points (from min 120 points)

Citations in scientific publications, monographs, collective volumes, and patents, refereed and indexed in internationally recognized scientific databases (Web of Science and Scopus) – 209 citations on 48 publications - total 418 points (from a minimum of 120 points).

Indicators E - 203.7 points (from minimum 150 points)

Participation in a national scientific or educational project – 2

Participation in an international scientific or educational project – 6

Leadership of a national scientific or educational project – 2

Funds attracted from projects where the candidate is a Head of the project – 118,531.53 BGN.

Total - 1123.7 pts (out of a minimum of 640 pts), meaning the candidate's scores almost double the minimum requirements for the position.

4. Main scientific and scientific-applied contributions.

5.

I accept and agree with the scientific and applied scientific contributions formulated by the candidate in the thematic areas, namely:

Thematic Area I. Improving the resilience and energy efficiency of production systems with batch processes, using conventional industrial municipal wastewater treatment systems that apply the autothermal thermophilic aerobic digestion (ATAD) process for sludge.

Scientific contributions:

1. Developing an optimization-based stochastic approach for the reconstruction of heat-integrated Autothermal Thermophilic Aerobic Digestion (ATAD) systems operating under uncertainty regarding the parameters of input-output flows.
2. Developing an approach to reduce the computational complexity of a two-stage stochastic optimization problem, applied to limiting the impact of uncertain parameters on a conventional ATAD system.
3. Developing a method for assessing the flexibility index in the reconstruction of heat-integrated ATAD systems operating under uncertainty.

Scientific - applied contributions:

1. Developing artificial neural network (ANN) models for a two-stage ATAD bioreactor system.
2. Development of heat integration models for streams in ATAD systems.
3. Conducting simulations of the operation of the thermally integrated ATAD system using ANN models.

Thematic Area II. Optimal Design of Sustainable Resource-Supply Chains for the Production and Distribution of Biofuels Using Various Bioresources

Scientific contributions:

1. Developing an integrated multi-criteria approach for the optimal design of a sustainable resource-supply chain (RSC) at a strategic level for the production and distribution of biodiesel/diesel using first-generation (sunflower and rapeseed) and second-generation (waste vegetable oils and animal fats) bioresources.
2. Developing a deterministic approach for optimal design of a sustainable combined RSC at the strategic level for the production and distribution of dairy products and biodiesel, using dairy waste scum (DWS) as the raw material for biodiesel production.

Scientific - applied contributions:

1. Implementation of an approach for optimal design of RSC for the production and distribution of biodiesel/diesel on the scale of Bulgaria;
2. Implementation of an approach for optimal design of a biodiesel/diesel production and distribution facility using environmental and economic criteria under two scenarios: one with 27 blending centers, and one with a single blending center at the scale of Bulgaria.
3. Implementation of an approach for the optimal design of a combined RSC for the production and distribution of dairy products and biodiesel on the scale of Bulgaria, using data from dairy farms, dairy companies, and biorefineries.

Thematic Area III. Optimal Design of Sustainable Resource-Supply Chains for the Production and Distribution of Dairy Products.

Scientific contributions:

1. Developing a deterministic approach for optimal design of resource-supply chains at the tactical level for the production and distribution of dairy products made using different technologies (recipes).
2. Developing a stochastic/robust optimization approach for the optimal design of resource-supply chains at the tactical level for the production and distribution of dairy products made with different technologies (recipes) to manage uncertainties in the chain's parameters.

Scientific - applied contributions:

1. Implementation of the deterministic approach for optimal design of resource-supply chains for the production and distribution of dairy products made using different technologies (recipes) based on a real case from Bulgaria.
2. Implementation of the stochastic/robust approach for optimal design of resource-supply chains for the production and distribution of dairy products made using different technologies (recipes) based on a real case from Bulgaria.

Thematic Area IV. Mechanical behavior and delamination of layered nanocomposites - analytical methods and optimization.

Scientific contributions:

1. Development of a 2D analytical method for analyzing stresses and strains in three-layer nanocomposites;
2. Analytical model criterion for delamination in nanocomposites under static loading;
3. Analytical modeling of hygrothermomechanical behavior of graphene/PMMA nanocomposite;
4. Investigating the influence of the type of adhesive/glue on delamination in piezoelectric structures under dynamic loading.

Scientific - applied contributions:

1. Analytical modeling of interfacial shear stress and strains in nanocomposites with WS₂ and hBN;
2. Determining safe load and geometry ranges for nanocomposite structures;
3. Multi-parameter optimization of the geometry and loading of hBN/PMMA nanocomposite using a genetic algorithm
4. Validation of the analytical method with experimental data from Raman spectroscopy.

5. Reflection of the candidate's scientific publications in Bulgarian and foreign literature.

The candidate's publications have received wide coverage in specialized scientific literature.

6. Critical notes and recommendations.

From the materials provided, the vision for work in the coming years is not clearly evident.

7. Personal impressions of the reviewer about the candidate

I have known Assoc. Prof. Elisaveta Georgieva Kirilova (Shopova), Ph.D since she started working at IChE-BAS. In her work, she has always stood out for her persistence, deep scientific interests, and focus on achieving scientific results. As the Scientific Secretary of the Institute and a colleague, Elisaveta is a responsive and brilliant person, which in itself is no less important than her significant scientific contributions.

CONCLUSION All quantitative indicators for evaluating the candidate's research and academic activities meet or exceed the requirements for holding the academic position of 'Professor.' On this basis, **I confidently support the candidacy of Assoc. Prof. Dr. Elisaveta Georgieva Kirilova (Shopova) and recommend that the scientific jury and the scientific council of IChE-BAS award her the academic position of 'Professor'.**

10.08.2026
Sofia


(prof. Elena Razkazova, Ph.D)