EVALUATION REPORT

from Assoc. Professor Dr. MARINA TODOROWA PRIMATAROWA
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on a procedure for the occupation of the academic position "Professor" in the professional field 4.1. "Physical Sciences", specialty "Electric, magnetic and optical properties of the condensed matter" (multiferroic properties of bulk samples and nanomaterials) in the discipline "Physics with Biophysics"
Procedure code: WWI-P-1123-112

Candidate in the procedure for professor according to the announcement of the Department of Mathematics, Physics and Informatics, Faculty of Forest Industry, University of Forestry in the State Gazette, issue 102/08.12.2023 and its website is **Dr. Iliana Naumova Apostolova**, Associate Professor at the Department of Mathematics, Physics and Informatics, Faculty of Forest Industry, University of Forestry.

1. Brief biographical data

Iliana Apostolova is born on 23.03.1970 in Mezdra, Bulgaria. In 1988 she graduated the Mathematics High School Akademik Ivan Tsenov in Vratsa. From 1988 she studied physics at Sofia University "St. Kliment Ohridski". In 1993 she obtained a Master's degree in Solid State Physics and in 1994 after distance learning the professional qualification "Physics Teacher".

In the period 1994-95 Iliana Apostolova is teacher of physics and informatics in the High School 54 St. Ivan Rilski, Sofia. Since November 1996 she has been working at the Department of Mathematics, Physics and Informatics, Faculty of Forest Industry, University of Forestry. She first was assistant professor (1996-2008), then chief assistant professor (2008-2015) and since 27.01.2015 is associate professor.

In 2012 as a doctoral student at the Department of Solid State Physics and Microelectronics of the Physics Faculty of the Sofia University "St. Kliment Ohridski" Iliana Apostolova successfully defended her doctoral thesis entitled "Static and dynamic properties of magnetic and multiferroic nanoparticles" and received the PhD diploma. Supervisor was Prof. D.Sc. Julia Wesselinowa.

2. General description of the submitted materials (the groups of indicators and quartiles cited below are defined in the Implementing Regulations of the Law on Development of the Academic Staff in the University of Forestry, Professional field 4.1, Tables 1 and 2)

The candidate Assoc. Prof. Dr. Apostolova has submitted for the participation in the procedure the following materials:

Indicator A1 – The PhD thesis is presented here providing the necessary 50 points.

Indicator B4 - 11 scientific papers in journals with impact factor (IF) are presented: 5 articles with Q2 and 6 articles with Q3, which provide in total 190 points at required minimum of 100 for *group B*. All articles are published in prestigious international scientific journals: 3 in physica status solidi (b), 2 in Solid State Communications, 2 in Thin Solid Films and 1 in European Physical Journal B, in Magnetochemistry and in Materials Today Communications. 8 of these papers are with two coauthors and 3 with three coauthors. Dr. Apostolova is first author in 6 articles.

Indicator Г7 – 47 scientific papers in journals with IF are presented: 4 articles with Q1, 27 articles with Q2, 13 articles with Q3 and 3 articles with Q4, which provide in total 871 points at required minimum of 200 for *group Г*. The papers are published in prestigious international scientific journals: 12 in physica status solidi, 7 in Modern Physics Letters B, 5 in European Physical Journal B, 3 in Solid State Communications, 3 in Journal of Magnetism and Magnetic Materials, 3 in Magnetochemistry, 2 in Physica E, 2 in Physics Letters A, 2 in Phase Transitions, 2 in Nanomaterials and 1 in Journal of Alloys and Compounds (IF=6.371), Europhysics Letters, Journal of Applied Physics, International Journal of Modern Physics B, Materials and Applied Sciences. 38 of these papers are with two coauthors, the rest 9 with three and more coauthors. Dr. Apostolova is first author in 19 of the articles.

Indicator Д11 - A list of 414 independent citations is presented (in total 828 points at required minimum of 100). All citations are in journals with IF.

In *group E* the activities of Assoc. Prof. Apostolova provide 170 points at required minimum of 150. Three university textbooks in Bulgarian are included: I. Apostolova, A. Apostolov, Physics with biophysics (2016); I. Apostolova, Physics with biophysics for ecologists (2023) and I. Apostolova, Tests in Physics and Physics with Biophysics for Forestry University Students (2022). She was participant in 9 national scientific projects.

All materials submitted in the procedure (scientific papers, citations, university textbooks, scientific projects) are from the last nine years i.e. the period after I. Apostolova has occupied the academic position "Associate Professor".

3. General characteristics of the scientific activities of the candidate

The research interests of Assoc. Prof. Apostolova are in the field of the condensed matter theory, particular in the study of magnetoordered ferro/antiferroelectric multifunctional materials (bulk samples, thin films and nanoparticles). This is a field of considerable interest, growing rapidly with potential for different applications.

The publications in the Habilitation thesis [XC1-XC11] are devoted to the magnetoelectric interactions in bulk samples and nanostructures. There are defined the microscopic model Hamiltonians which describe the electric and magnetic subsystems and the magnetoelectric coupling between them for a large amount of complex compounds. In this way the macroscopic behavior of the multiferroic systems can be predicted. The conditions for ion doping and size change of the multiferroic compounds, for which „room temperature multiferroism" can appear, are obtained. The Green function method is used for the theoretical determination and numerical calculation of the physical characteristics of different multiferroic systems. The significance of the proposed models and obtained results is confirmed through the qualitative and quantitative agreement with lots of experimental data. All models consider real materials and systems which have potential possibilities for practical applications in the field of the nanotechnologies.

Basic contribution of the other 47 scientific publications included in the procedure is the systematic study and analysis of the magnetoelectric interactions which leads to the appearance of multiferroism. They can be classified as follows:

1. Different mechanisms for the appearance of spin-induced polarization in bulk multiferroic samples are investigated [2-7, 10, 17, 23, 27, 29, 31-34].

2. The influence of the ion doping in low dimensional multiferroic systems is obtained [1, 20, 22, 25, 26, 39, 41, 43, 45].

3. The possibilities for the observing of room temperature magnetism and room temperature multiferroism in doped magnetic and multiferroic nanoparticles are studied [9, 12, 13, 16, 21, 30, 37, 38, 40, 44, 46, 47].

4. Nanoparticle models are found for application in the field of the self-controlled magnetic hyperthermia [11, 18, 24, 28, 36, 42].

5. The phonon spectra in multiferroic and magnetic bulk samples and low dimensional systems are analyzed [8, 14, 15, 19, 35, 38].

4. Impact of the scientific publications of the candidate in the literature

The citation list is respectful. It includes 414 citations (excluding self-citations) in prestigious international journals with impact factor. I have noticed 20 citations more after the beginning of the procedure. This is a conformation that the contributions of Dr. Apostolova are well known to the international scientific community. No doubt the field of investigation as well as the obtained results are of great interest.

5. Assessment of the personal contribution of the candidate

46 scientific papers from the submitted 58 are with coauthors J. Wesselinowa and A. Apostolov. The other 12 [1-4, 7, 9, 10, 21, 33, XC4, XC10, XC11] are due to a successful collaboration with scientists from the Martin Luther University, Halle, Germany. Iliana Apostolova is first author in 25 of the scientific publications and second author in the other 33. This clearly is an evidence for the personal contribution of the candidate in the submitted materials.

Important is the leading role in the three university textbooks: I. Apostolova, A. Apostolov, Physics with biophysics (2016); I. Apostolova, Physics with biophysics for ecologists (2023) and I. Apostolova, Tests in Physics and Physics with Biophysics for Forestry University Students (2022).

The Hirsch index of Iliana Apostolova is h=11.

6. Personal impressions

I know Iliana Apostolova since the defence of her doctoral thesis. Then, from her participation in scientific projects, seminars, discussions etc. I have had the possibility to observe her career. She is an erudite researcher, thorough and precise in the work, with sense for interesting scientific problems and application of the theoretical results.

7. Conclution

The submitted materials in the procedure characterized Assoc. Prof. Iliana Apostolova as a qualified university lecturer with intensive scientific activities in a modern field of the condensed matter physics. She not only covers but far exceed the national requirements and the requirements of the University of Forestry for the occupation of the academic position "Professor". It is important to note that by the required minimum of 600 points she applies with 2109. Special attention has to be paid on the publications and the citations which are all in international journals with IF.

Based on the foregoing, I strongly support the application of Associate Professor Dr. Iliana Naumova Apostolova for the occupation of the academic position "Professor" in the professional field 4.1. "Physical Sciences", discipline "Physics with Biophysics" at the Department of Mathematics, Physics and Informatics, Faculty of Forest Industry, University of Forestry.

27.03.2024 г. Member of the jury:

/Assoc. Prof. Dr. M.T. Primatarowa/