

## REPORT

of dissertation for the acquisition of:

|  |                                       |
|--|---------------------------------------|
| educational and scientific degree " doctor " | X                                     |
| scientific degree "Doctor of Science"        |                                       |
|  | the true is indicated by the sign "X" |

## Author of the dissertation:

|                          |                      |        |             |           |   |
|--------------------------|----------------------|--------|-------------|-----------|---|
| Assist.<br>Prof.<br>Eng. |                      | Georgi | Bozhilov    | Georgiev  | University of Chemical<br>Technology and<br>Metallurgy, Department<br>of Textile, Leather and<br>Fuels, Sofia |
| academic<br>position     | scientific<br>degree | name   | middle name | last name | workplace   |

## Topic of the dissertation:

|   |
|---|
| Synthesis and Application of Modified Carbon Materials Derived from Renewable Raw Materials and Industrial Wastes |
|---|

## Scientific area:

|      |                    |
|------|--------------------|
| 5.   | Technical sciences |
| code | name               |

## Professional area:

|       |                     |
|-------|---------------------|
| 5.10. | Chemical technology |
| code  | name                |

## Scientific specialty:

|   |
|---|
| Technology of natural and synthetic fuels |
|---|

## The report was written by:

|                      |                      |       |             |           |  |
|----------------------|----------------------|-------|-------------|-----------|--|
| Assoc.<br>Prof.      | PhD                  | Peter | Tzvetanov   | Tzvetkov  | Institute of General and<br>Inorganic Chemistry,<br>BAS, Sofia |
| academic<br>position | scientific<br>degree | name  | middle name | last name | workplace  |

## 1. Meeting the minimum requirements under the Regulations:

|  |           |   |
|--|-----------|---|
| A) The candidate meets the minimum requirements        | 20 points | X |
| B) The candidate doesn't meet the minimum requirements | 0 points  |   |

|  |  |  |
|--|--|--|
|  |  | one of the answers given is marked with the sign "X" |
|--|--|--|

It is mandatory to fill in if answer B is marked. The publication activity of the candidate is analyzed. The response of the results achieved (quoted) is analyzed.

## 2. The relevance of the topic of the dissertation:

|   |          |  |
|---|----------|--|
| A) The topic is relevant and new (there are no known results on the topic by other authors) | 8 points |  |
| B) The topic is relevant and results from other authors are known                           | 6 points | X  |
| C) The topic is not relevant, but results from other authors are known                      | 2 points |  |
| D) The topic is not relevant and no results from other authors are known                    | 1 point  |  |
| E) The topic does not correspond to the level of dissertation                               | 0 points |  |
|   |          | one of the answers given is marked with the sign "X" |

The evaluation of the relevance of the dissertation must be substantiated

The topic of obtaining activated carbon from waste biomass is extremely relevant in the context of the European Union's policies for green transition, circular economy and sustainable resource management. The growing requirements for waste reduction, limiting carbon emissions and increasing resource efficiency direct scientific and industrial interest to technologies for the utilization of biomass and other waste with high added value.

Therefore, research aimed at optimizing the processes for the production and application of activated carbon from waste biomass, household and industrial waste has significant scientific, environmental and economic importance, which determines the high relevance of the dissertation topic.

## 3. Type of research:

|  |          |  |
|--|----------|--|
| A) Theoretical   | 4 points |  |
| B) Applied   | 4 points |  |
| C) Theoretical with application elements               | 4 points | X  |
| D) It does not correspond to the level of dissertation | 0 points |  |
|  |          | one of the answers given is marked with the sign "X" |

The level of research must be substantiated if answer D is marked.

## 4. Objectives of the research:

|  |          |   |
|--|----------|---|
| A) Realistic and of scientific and / or applied interest | 8 points | X |
|--|----------|---|

|   |          |  |
|---|----------|--|
| B) Realistic, but not of scientific and / or applied interest | 3 points |  |
| C) Unattainable (unrealistic)                                 | 0 points |  |
|   |          | one of the answers given is marked with the sign "X" |

|   |
|---|
| Objectives must be specified. The type of the set objectives must be justified.   |
| <p>The main objectives of the dissertation are mainly of an applied nature and are related to the synthesis and modification of carbon materials, in particular activated carbon and carbon foam, by utilizing cheap raw materials and waste: lignocellulosic biomass, household, industrial and construction waste (bitumen waterproofing).</p> <p>To achieve this goal, the following tasks have been set:</p> <ul style="list-style-type: none"> <li>- Use of chemical and physicochemical treatment to optimize the porosity, specific surface area and type of functional groups on the surface of the materials.</li> <li>- Evaluation of the effectiveness of the obtained carbon materials as adsorbents for the purification of wastewater and air from organic and inorganic pollutants.</li> <li>- Testing of a catalyst supported on a carrier from the obtained carbon materials for certain chemical processes and explanation of the mechanism of action.</li> </ul> |

#### 5. Contributions of the dissertation:

|  |           |  |
|--|-----------|--|
| A) With lasting scientific and / or applied response, they form the basis for new research and applications    | 20 points |  |
| B) They are of significant scientific and / or applied interest, complete and / or summarize previous research | 16 points | X  |
| C) They are of scientific and / or applied interest  | 12 points |  |
| D) Lack of significant contributions   | 8 points  |  |
| E) Lack of contributions   | 0 points  |  |
|  |           | one of the answers given is marked with the sign "X" |

|   |
|---|
| Contributions must be specified. The type of results achieved must be justified.  |
| <p>The scientific and applied scientific contributions of the dissertation can be summarized in the following three areas:</p> <ul style="list-style-type: none"> <li>- A new energy-efficient synthesis method for converting waste into functional carbon materials has been developed. The method is simplified and can be used to obtain activated carbon and carbon foam in an open system without pressure and inert environment.</li> <li>- Scientific contributions. A clear relationship has been established between the origin/composition of the starting waste raw materials, the conditions of thermal and chemical treatment and the formation of the final porous and graphite-like structure.</li> <li>- Highly efficient carbon adsorbents for water purification from organic pollutants have been synthesized, as well as new heterogeneous catalysts with combined (Brønsted and Lewis) acidity, demonstrating a synergistic effect in valuable chemical conversions (from glucose to 5-hydroxymethylfurfural).</li> </ul> |

**6. Conclusion**

|  |   |  |
|--|---|--|
| A) The evaluation of the dissertation is <b>POSITIVE</b> | This evaluation is assigned to a total number of at least 40 points | X  |
| B) The evaluation of the dissertation is <b>NEGATIVE</b> | This evaluation is assigned to a total number below 40 points       |  |
|  |   | one of the answers given is marked with the sign "X" |

|   |
|---|
| To be filled in at the request of the member of the scientific jury |
|   |

|                   |                            |           |
|-------------------|----------------------------|-----------|
| <b>04.06.2026</b> | The report was written by: |           |
| date              |                            | signature |