

**Prof. Dr. hab. Michał Giersig**

Foreign member of Polish Academy of Sciences

Head of Department: Theory of Continuous Media and Nanostructures

Institute of Fundamental Technological Research Polish Academy of Science

Pawińskiego St. 5B; 02-106 Warsaw, Poland

e-mail: [mgiersig@ippt.pan.pl](mailto:mgiersig@ippt.pan.pl)

<https://www.ippt.pan.pl>



Review of the doctoral dissertation submitted by Teng Zheng's with the title

"Materials activated with lanthanides (III or II).  $\text{SrB}_4\text{O}_7$  and  $\text{BaTiO}_3$  materials for luminescent manometers and non-linear optical thermometry"

in the form of a thematically related series of articles, published in scientific journals.

The doctoral thesis of M. Sc. Teng Zheng was carried out under the supervision of Prof. Dr. hab Stefan Lis from the Rare Earths Department at the Faculty of Chemistry at Adam Mickiewicz University in Poznan. This work is part of the department's excellent research area, mainly related to nanoscale inorganic materials, including synthesis and physicochemical properties with an in-depth understanding of luminescence spectroscopic analysis of the fabricated modified nanoluminophores.

As can be seen from the submitted dissertation by M.Sc. Teng Zheng, he was engaged with the synthesis, structural, physicochemical and photoluminescent characterization of inorganic materials such as  $\text{SrB}_4\text{O}_7$ ,  $\text{BaTiO}_3$  and  $\text{Sr}_3(\text{BO}_3)_2$  doped with Ln (II) or Ln (III) ions.

Teng Zheng's doctoral thesis is written in English and contains the most important results from his 6 publications, which are very closely related. The presentation was very well done and is scientifically correct. The general goals of the work were formulated well and understandably. In the introduction M.Sc. Teng Zheng thoroughly described the fundamentals of Ln ion luminescence with a related discussion of the 5d-4f emission process of selected Ln<sup>2+</sup> ions ( $\text{Eu}^{2+}$ ,  $\text{Sm}^{2+}$  and  $\text{Tm}^{2+}$ ) and up-conversion luminescence. Furthermore, the extraordinary role of inorganic host matrices Strontium tetraborates ( $\text{SrB}_4\text{O}_7$ ) and barium titanate perovskites ( $\text{BaTiO}_3$ ) in the construction of designed materials are well explained and discussed.

The research projects (individual publications) carried out by Teng Zheng underline the scientific world-renowned trend towards the design and synthesis of new luminescent nanomaterials, considering possible applications in optoelectronics and biomedicine.

The individual goals were well defined and successfully implemented in the 6 publications of 9 other from JCR lists. His results on the development and the characterization of materials composed of inorganically doped Ln (II) and Ln (III) ions and highly durable oxide matrices with potential use as luminescence manometers and nonlinear optical thermometers are of high scientific interest.

Zheng's examination of the state of knowledge on research aspects based on numerous publications makes a very good impression. The finally obtained results and their interpretation are confronted with other scientific findings and prove the thorough and comprehensive knowledge of the candidate.

All results from the 6 most important publications presented in the dissertation correspond to the requirements prescribed worldwide and do not need to be mentioned further. With this work, the candidate has convinced me that he can implement his own ideas and implement them excellently.

In summary, I am of the opinion that the dissertation by M.Sc. Teng Zeng is performed at a very high scientific level with extremely valuable novelty.

All ambitious research goals have been achieved and their potential applications as novel manometers and non-linear optical thermometers have been extensively exploited and documented.

The candidate M.Sc. Teng Zeng meets all content requirements for the doctoral thesis according to Article 187 of the Law of July 20, 2018 – Law on Higher Education and Science.

Therefore, a further admission M.Sc. Teng Zeng on the next steps, the doctoral process, is highly desirable and fully recommended.

I rate the dissertation as very good and confirm that this work complies with European and world regulations.

Sincerely,

Michał Giersig



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