

**REVIEW**  
**from the local scientific supervisor**  
**Doctor of chemical Sciences, Professor Mukhambetkali Burkitbayev**

**For the thesis of Natalya Vladimirovna Khan**

**“Preparation and application of micro-/nano-structures based on sulfur and silver halides”**  
**submitted for the degree of Doctor of Philosophy (PhD) in the specialty “6D072000 –**  
**Chemical Technology of Inorganic Substances”**

To date, the production of new materials using semiconductors is of great interest, since they can be used in many fields of science and technology. In the modern world, more and more research is devoted to finding solutions to problems in the field of alternative energy sources. As well as in the era of the pandemic, the search for substances that can cause pathogenic microorganisms. One of the most promising materials are sulfur and silver halides, due to the fact that they have a number of specific properties and can act as universal materials for a wide range of applications.

The thesis work of Natalya Khan is devoted to the synthesis of the micro-/nano-structures based on sulfur and silver halides and their application in photocatalysis and microbiology. The materials were synthesized via solvothermal synthesis with using of two methods of sulfur precipitation. Natalya Khan conducted a large amount of experimental work during her doctoral studies. She independently worked out the synthesis modes, as well as the composition of the final products. She mastered the methods of conducting photocatalytic and microbiological experiments, which she subsequently applied on her synthesized materials. As a result, Natalya Khan obtained a new material based on sulfur and silver halides ( $S/AgX$ ,  $X=Cl, Br, I$ ), which showed the ability to degrade organic dyes by the action of visible light, as well as to suppress a number of pathogenic microorganisms.

Research results obtained by Natalya Khan were reflected in 9 scientific publications, including one article in an international journal with a non-zero impact factor ( $IF=7.392$ , Q1) according to the Web of Science database, one article in an international journal included in the Scopus database, three articles in scientific journals recommended by the Committee for Quality Assurance in the Field of Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan, one patent for a utility model of the Republic of Kazakhstan and three abstracts of international conferences.

I firmly believe that Natalya Khan shows great promise as a specialist in this field and the results obtained by her have scientific significance and practical application. Thesis results obtained by candidate fully meets all the requirements of the Committee for Control on the Field of Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan. The author deserves awarding of the PhD degree in the specialty “6D072000 – Chemical Technology of Inorganic Substances”.

## National University



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