



The 8<sup>th</sup> International Conference on Nanomaterials and Advanced Energy Storage Systems (INESS-2020)

## Smart window design with aerosol trap, greenhouse gardening and powered by solar panels

Svetlana Mikhailova\*, Leonid Mikhailov\*\*, Guzal Ismailova, Nursultan Kenes,  
Raiymbek Yersaiyn, Ruslan Mahmutov

IETP, al-Farabi Kazakh National University, 71 al-Farabi avn. 050040 Almaty, Kazakhstan

\*E-mail: svetik.mikhailova@gmail.com

\*\*E-mail: deonid@mail.ru

Photovoltaic panels usage in urban conditions only for energy production is unprofitable, since energy from traditional energy sources is much cheaper and the infrastructure for transporting energy to consumers in cities has already been formed. Fundamental difference between the proposed device in social and economic terms is that the individual consumer is offered not energy from the power plant, but a household device with a combination of LED illuminator with and sunlight-regulating external blinds [1, 2]. Along the way, it will help to solve global human problems of ecology, by cleaning the air from smog, contaminated aerosols and using "green" energy. Even when the solar panel is not lit, it can act as a dust and aerosol collector, a heat and light screen for the room.

The aim of this development is usage of solar energy in windowed household systems for the following consumer functions: 1) night and regulated daytime room lighting; 2) for cleaning the air basin of the city from smog and aerosols; 3) for additional heat and sound insulation. Relevance of the study is also associated with measures to reduce greenhouse gas emissions through the use of alternative sources and helps to solve the problem of their cost-effective use.

A working designed model was created being scaled down 1:5, where consumer functions are tested and refined after modeling in AutoCAD. A device based on solar panels provides the combination of several consumer properties and a combination of three stand-alone modules placed on a single metal structure, fixed in the aperture and on the window frame. The model has five static and three dynamic modes of operation. Electromechanical and photoelectric part of the prototype device was manufactured and the study of the technical characteristics was carried out. Note that power calculations were performed for the full-scale prototype version. A full-size model of the device was made on the window at Faculty of Physics and Technology of al-Farabi KazNU.

### Acknowledgement

This research was supported by the grant AP05132897 of the Ministry of Education and Science of Kazakhstan Republic

### References

- [1] L.Mikhailov, S. Mikhailova, G. Ismailova et al. - Mediterranean Green Buildings & Renewable Energy. (2017) 609 – 617.
- [2] L.V. Mikhailov, A.M. Sidlyarov, N.S. Gabdulova, et all. - High-performance computing systems and technologies. 8 (2018), 172-176.