Luminescent Films for Silicon Solar Cells

G.P. Shevchenko[1], Y.V. Bokshits[1], E.A. Kovel[1], N.V. Shinkevich[2],
A.V. Mazanik[2], D.A.Sherban[3], N.N.Kurmey[3], L.I.Brook[3], V. A. Zhuravkov[1]
[1]Research Institute for Physical Chemical Problems, Belarusian State University,
Minsk, Belarus,
[2]BSU, Faculty of Physics, Minsk, Belarus,
[3]Institute of Applied Physics, Kishinev, Moldova
e-mail: *JuliaS106@mail.ru*

Today, silicon solar cells (SSC) are still dominant, and improving their efficiency is an urgent task. Therefore, the search for systems that could effectively transform the sun ultraviolet (UV) radiation into SSC maximum spectral sensitivity region is important.

Earlier, we found [1, 2] that CuI-containing oxide films under UV radiation (λ_{max}=720nm) exhibit luminescence in the visible spectral range from 600 to 1000 nm; in the area of maximum photosensitivity of the SC. This work is devoted to the study of SSC efficiency amplification by applying on it an additional layer of luminescent oxide films containing CuI doped with rare earth ions, as well as films of phosphor $Sr_4Al_{19}O_{25}$:Bi, Mn.

It was found that the deposition of luminescent films does not have a negative effect on the dark electrical parameters of the SSC used; but an increase in the parallel resistance of the solar cell is observed, leading to an increase in the current supplied to the load. The largest increase in the external quantum efficiency of photoelectric conversion of solar cells in the near UV range is observed for single-layer films of the composition $50Al_2O_3 - 50CuI$, heat-treated at 280°C for 30 min, which corresponds to a relative increase in the photocurrent upon exposure to radiation with a spectral composition of AM 1.5 (1000 W/m^2) by more than 35%.

The obtained results confirm the efficiency of using luminescent oxide – CuI films to the SSC efficiency amplification.

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References

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