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Photovoltage formation in perovskite solar cell under laser excitation

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Metal halide perovskites attract considerable attention due to their remarkable properties having potential applica tions in optoelectronic devices such as solar cells, photodetectors and light emitting diodes. In solar cells, metal halide perovskites are attractive for their high absorption coefficient across the entire visible range allowing using a thin film, high defect tolerance, high carrier mobility and long carrier diffusion length.

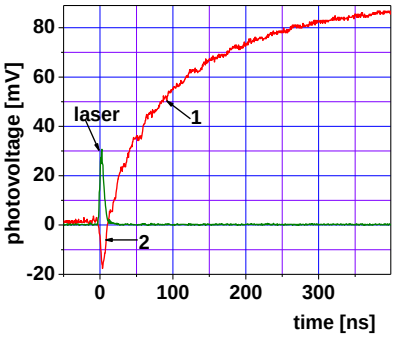

Fig. 1 Transient photovoltage induced in perovskite solar cell under illumination of short laser pulse with duration of 7 ns.

In this communication we present experimental study of optical and photoelectrical properties of solar cells fabricated on base cesium-containing triple cation perovskite film $Cs_x(FA_{0.83}MA_{0.17})_{(1-x)}Pb(I_{0.83}Br_{0.17})_3$. The method of fabrication of perovskite film was described in [1]. It was found that addition of Cs improves significantly the performance of perovskite solar cells and almost does not influence on the transparency of perovskite layers in infrared range. The measurements of transient photovoltage induced in perovskite solar cell under illumination short laser pulse shows that the photoresponse consists of two components, Fig. 1. The first one is usual photovoltage arising due to electron-hole pair generation. The second one is photovoltage follows the laser pulse and has opposite polarity, it is caused by the heating of free carriers [2].As in case CaAs p-n junction hot carriers decrease the power conversion efficiency of perovskite solar cells.

It will be noted that the solar cell with 10% of cesium in perovskite layer demonstrates the best power conversion efficiency of 20%.

REFERENCES

[1] S.Ašmontas, A.Čerškus, J.Gradauskas et al., et al., *Coatings* **11** (2021) p 279.
[2] S.Ašmontas, J.Gradauskas, A.Sužiedelis et al.,*Appl.Phys.Lett*. **113** (2018) p 071103