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Investigation of Overshoot Effect in Hybrid Perovskite Light Emitting Diodes.

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Hybrid perovskite light-emitting diodes (PeLEDs) are a promising new technology for the development of next-generation light sources. They are characterized by high photoluminescence (PL) and electroluminescence (EL) efficiency, which is now above 20%. Apart from their several advantages PeLEDs exhibit a new fundamental phenomenon: a short, high-intensity electroluminescence pulse (overshoot effect) that surprisingly has a very high intensity, sometimes ten times or more higher than the background signal of the EL [1]. It is therefore crucial to investigate this phenomenon as it could lead to a new field of application, e.g. low power, high intensity pulsed light emitting diodes or ultimately electrically pumped perovskite lasers.

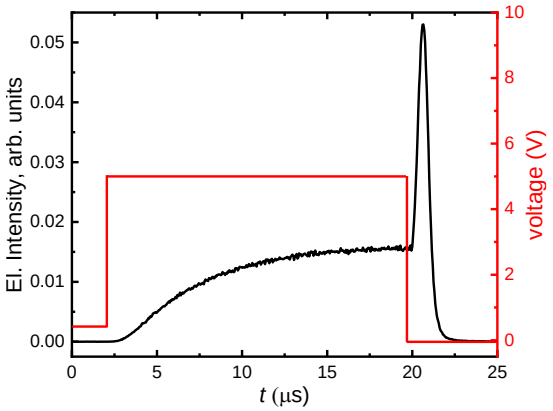

Fig. 1 EL transient after the application of 20 μs duration rectangular voltage pulse (red).

The work is focused on investigating overshoot effect and identifying a set of bias parameters that maximizes its intensity and efficiency. For this purpose, advanced characterization methods were used including transient EL and PL spectroscopy and transient photocurrent measurements. The EL overshoot was observed only at short voltage pulses (up to 100 μs). Also, the relative peak intensity increased at lower temperatures and by applying negative afterpulse voltage values. The results suggests that the formation of overshoot pulse is attributed to the mixing of accumulated electrons and holes by diffusion, while on longer time scales this effect is absent due to redistribution of mobile ions from the *p-i-n* structure.

REFERENCES

[1] Gegevicius, Rokas, et al. "Electroluminescence dynamics in perovskite solar cells reveals giant overshoot effect." *The journal of physical chemistry letters* 10.8 (2019): 1779-1783.