Supplementary information for

High charge carrier mobility in solution processed one-dimensional lead halide perovskite single crystals and their application as photodetectors

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Optical image of synthesised crystals

Figure S1. Optical image of the synthesised crystals in vial. Scale bar is 10 mm.

The statistical analysis of the crystal length

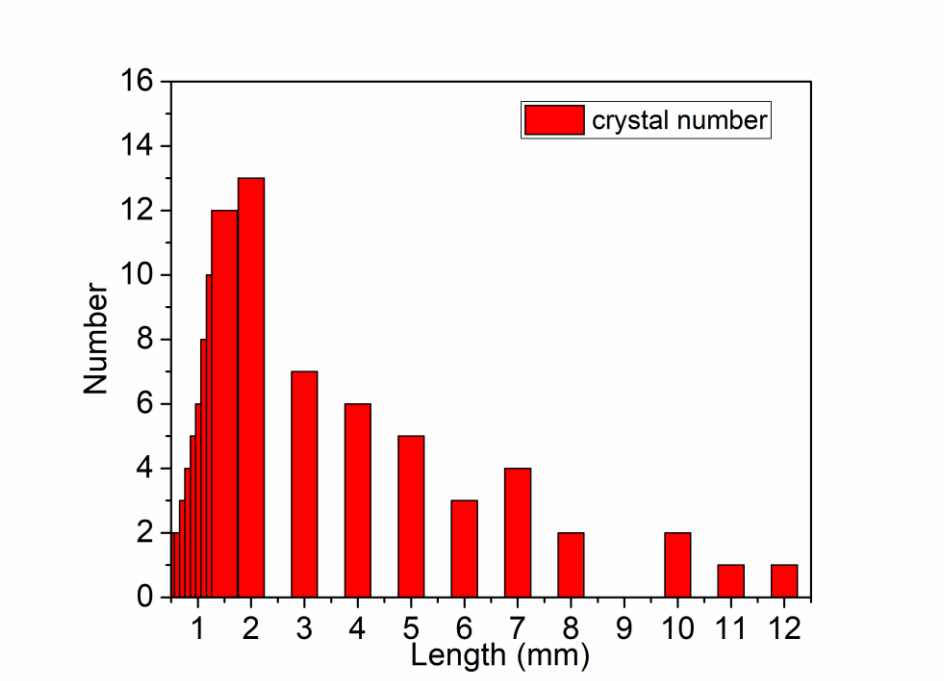

Figure S2. Statistical analysis of the length of the synthesised crystals.

Photodetector ON and OFF times

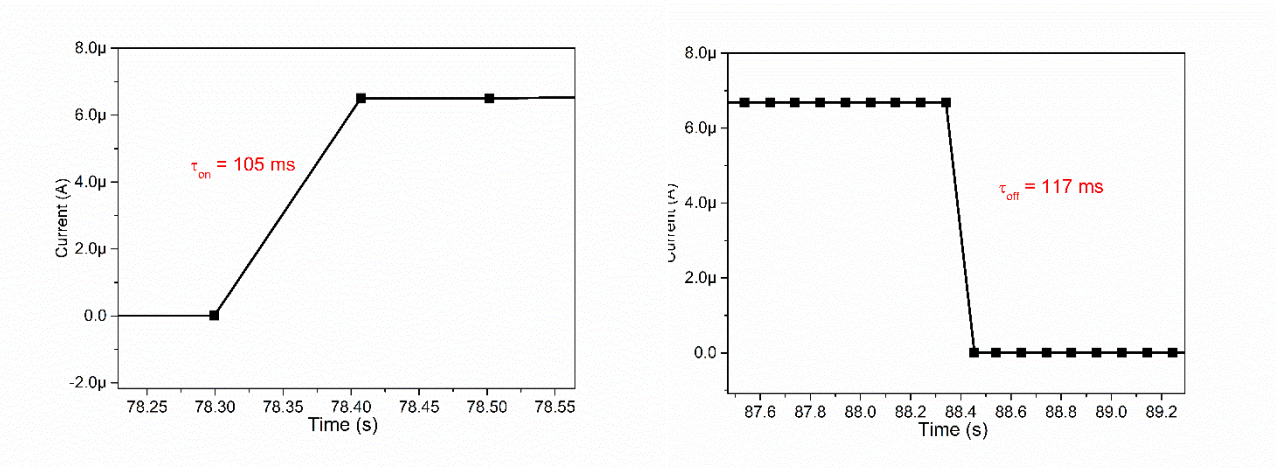

Figure S3. Photodetector response times. The response times marked for (left) ON and (right) OFF are an upper limit based on the time interval of the measurement.

Synthesis of $MAPbBr_3$ single crystals

The method of single crystal growth of $MAPbBr_3$ has been adapted from the literature.[1] Lead bromide ($PbBr_2$), Methylammonium bromide (MABr) and N,N-Dimethylformamide (DMF) were purchased from Sigma Aldrich and used without further purification. A 1M solution containing $PbBr_2$ and MABr was prepared in DMF. This bromide solution was prepared at room temperature and the solutions were filtered using a PTFE filter with 0.2-µm pore size. Two millilitres of the filtrate were placed in a vial and the vial was kept in an oil bath undisturbed at 80 C° during crystal growth. The crystal growth took around 6 h. All procedures were carried out under ambient conditions.

Table S1. A summary of UV responsivity in perovskite photodetectors

perovskites	responsivity (A W^{-1})	Illumination wavelength /intensity (mW cm^{-2})	response speed ON/OFF time	reference
$CH_3NH_3PbCl_3$	0.05	365 nm /1000	24 ms / 65 ms	2
$CH(NH_2)_2PbI_3$	0.68	380 nm /0.5	12.4 ms / 17.2 ms	3
$CH_3NH_3PbI_3$	3.49	365 nm /0.01	0.2 s	4
$CH_3NH_3PbCl_3$	7.56	360 nm /0.1	170 ms / 220 ms	5
$CH_3NH_3PbCl_3$	18	385 nm /4×10^{-6}	1 ms	6
Our work	132.3	375 nm /0.001	<105 ms / <117 ms	

Table S2. Charge carrier mobility perovskite nanowires and 1D crystals

perovskite	architecture	method	Mobility cm^2/Vs	ref.
$MAPbI_3$	nanowire	FET	0.01	7
$CsSnI_3$	nanowire	FET	0.09	8
$CsPbI_3$	nanowire	spectroscopy	3 ± 1	9
Our work	1D crystal	SCLC	4.5 at 300 K 9.2 at 120 K	

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