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Inorganic ions assisted design and synthesis of all-inorganic halide perovskite nanowires for sustainable solar-energy harvesting

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Metal halide perovskites with unique physicochemical properties have emerged to the forefront of light absorber materials, because of their great potential for solar cells, photodetectors, light-emitting devices, field-effect transistors and lasers.[1,2] Tunable wavelength, large diffusion length, long carrier lifetime, scalable and cost-efficient production are their most striking characteristics. These characters are, however, morphology and size dependent. To date, researchers have successfully engineered perovskites in the forms of nanocubes, nanospheres, and nanoplatelets with sizes controlled from several to hundreds of nanometers. However, the synthesis of perovskite nanowires with controlled morphology is rarely successful. In this communication, we show the feasibility of the controlled synthesis of $CsPbCl_3$ nanowires via the pretreatment by Cu^{2+} ions.[3] The resulting nanowires have a diameter of ca. 20 nm and an average length of 500 nm, with their structures and photoelectrochemical performance systematically studied. These $CsPbCl_3$ nanowires enabled a 3.5-fold photocurrent enhancement compared to untreated nanocubes. The results clearly suggest that they are a promising photonic material for fabrication of ultraviolet detection devices, as well as our newly developed method could be a generally effective way in controlling morphology and opto-electronic properties of all-inorganic halide perovskite nanostructures.

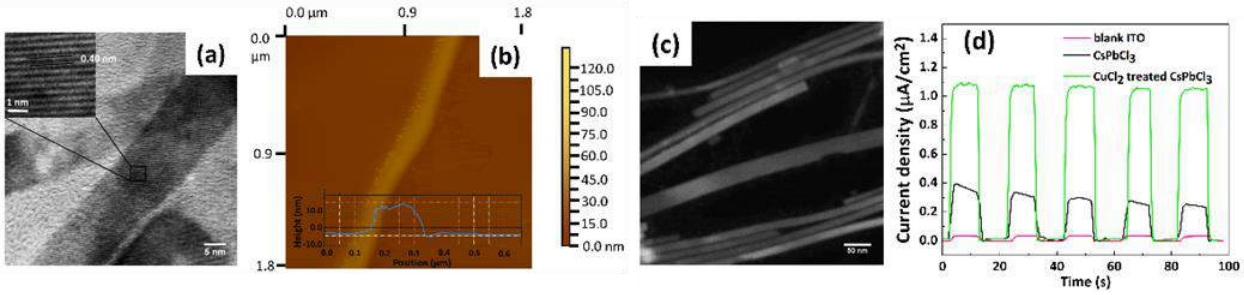

Figure 1. Characterizations of $CuCl_2$ pretreated $CsPbCl_3$ nanowires: (a) TEM image, (b) AFM image, (c) STEM image, and (d) comparison of photocurrent responses obtained at various photoelectrodes.

References

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(2) Grätzel, M. *Nature Mater.* **2014**, *13*, 838-842.
(3) Tang, Y.; Chi, Q. *The manuscript in preparation* **2017**.

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