Electronic Supplementary Material (ESI) for Materials Chemistry Frontiers.

Supplementary information

Grooves-assisted solution growth of lead bromide Perovskite aligned nanowires: a simple method towards photoluminescent material with guiding light properties

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Contents of Supporting Information

S1. Field emission scanning electron microscope (FESEM) images of DVD polycarbonate substrates and PDMS replica

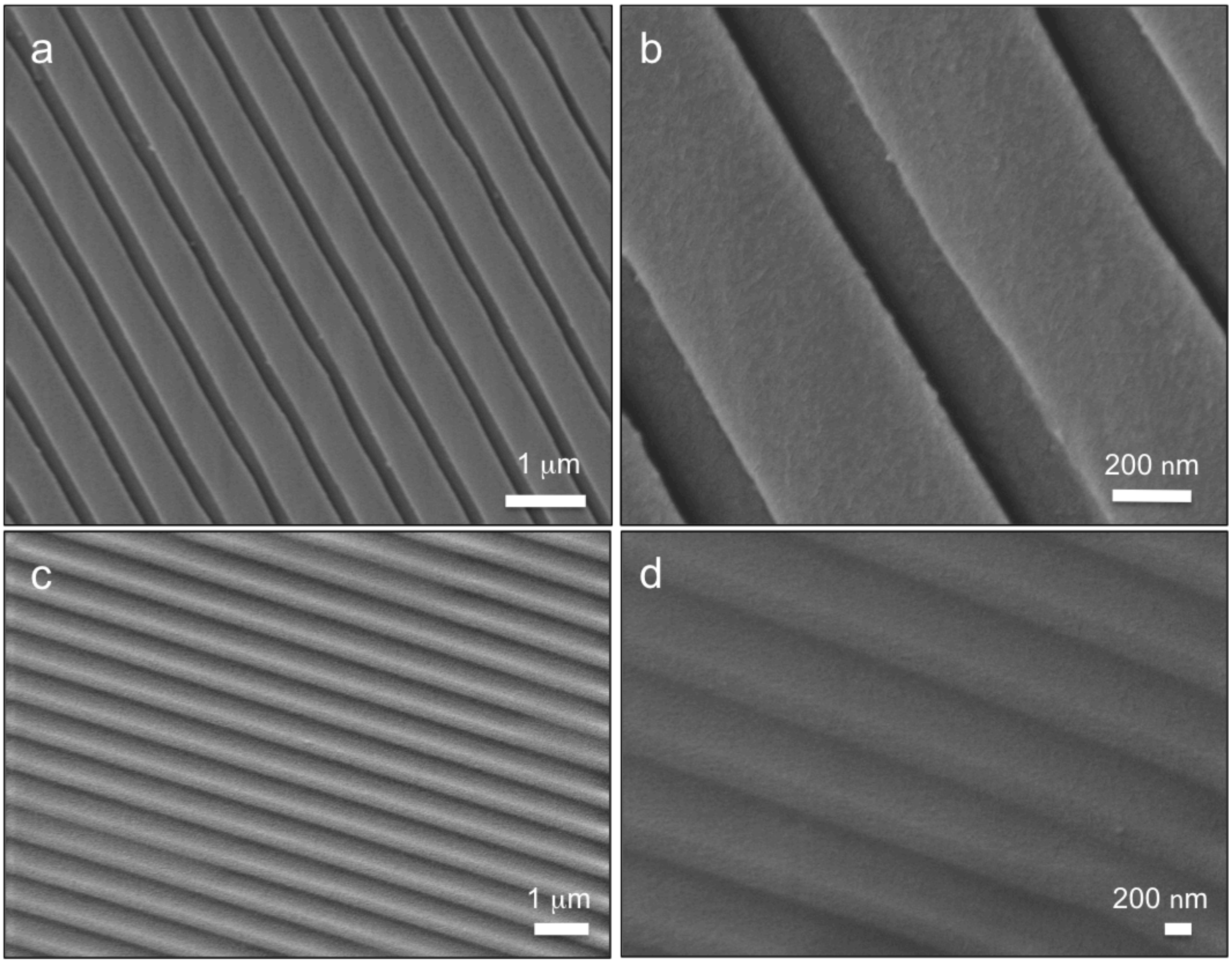

Fig. S1. Images taken with a Field emission scanning electron microscope of (a) and (b): a polycarbonate bottom plate of a DVD; (C) and (d) PDMS replica of a polycarbonate bottom plate of a DVD.

S2. Field emission scanning electron microscope (FESEM) images of CD polycarbonate substrates and PDMS replica

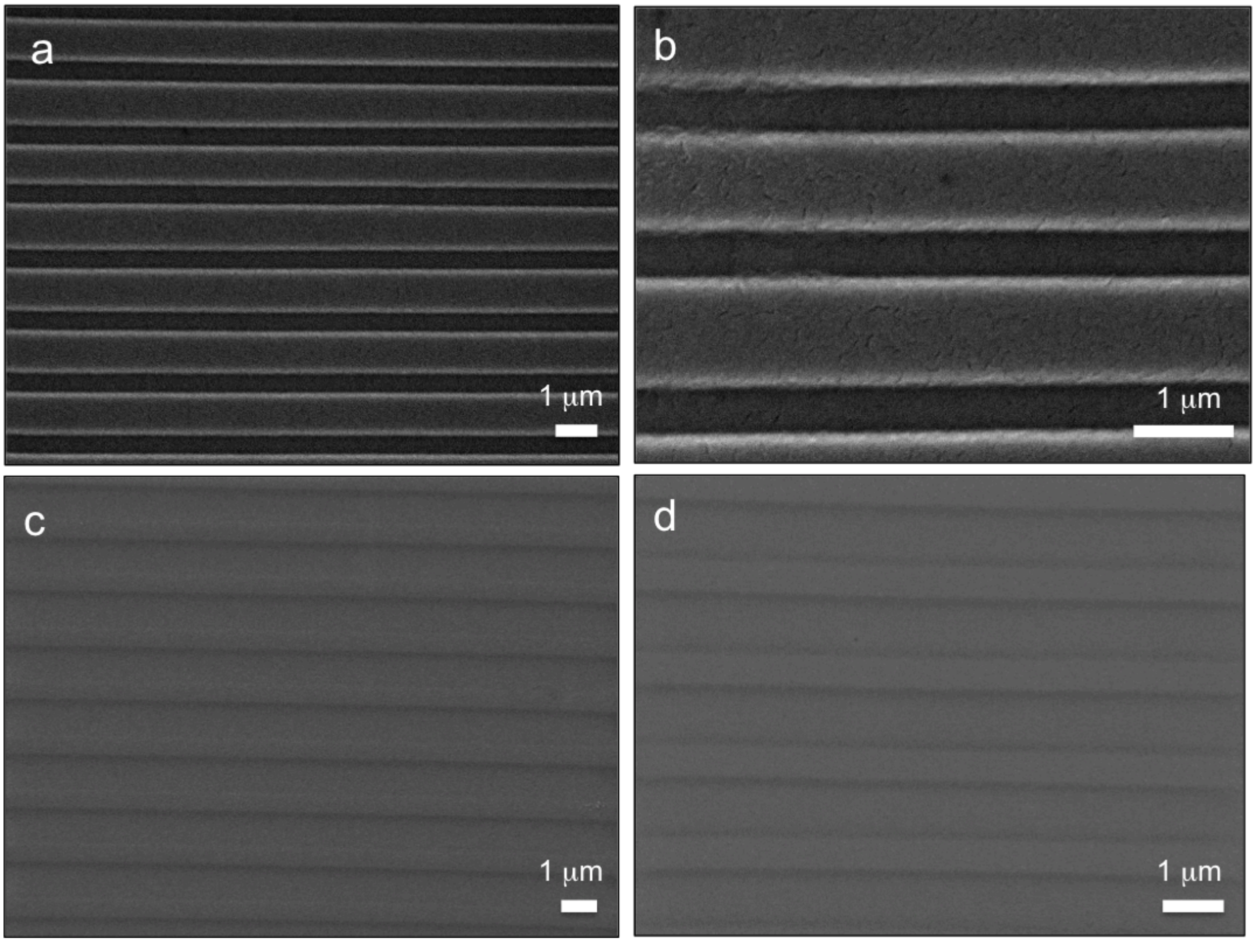

Fig. S2. SEM images of (a) and (b): a polycarbonate bottom plate of a CD; (C) and (d) PDMS replica of a polycarbonate plate of a CD.

S3. $MAPbBr_3$ nanowires characterization

In the case of $MAPbBr_3$ nanowires, XRD measurements also reveal a crystalline structure with the characteristic peaks of a cubic structure [1S]. However, $MAPbBr_3$ nanowires seems to crystalize preferentially in the (001) direction compared to a film structured material (Fig. S3 (c)).

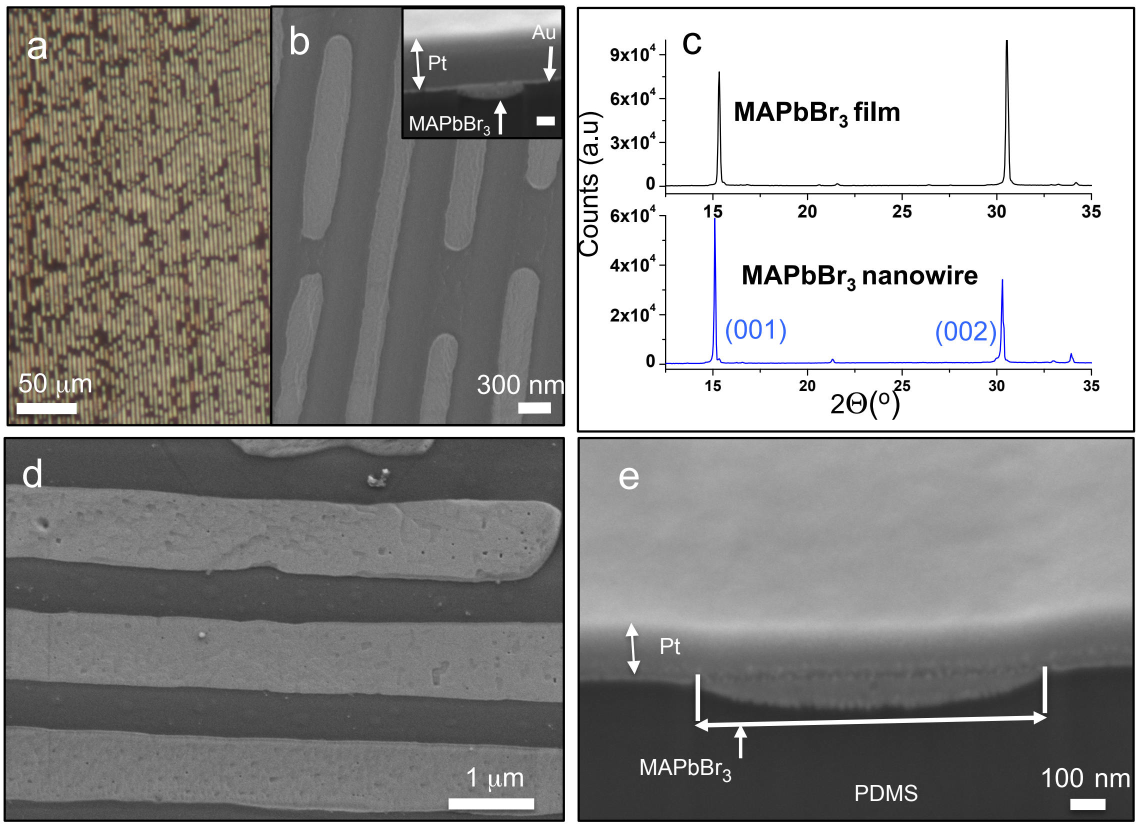

Fig. S3. Polycrystalline $MAPbBr_3$ nanowires characteristics. (a) and (b) optical and FESEM images respectively of $MaPbBr_3$ nanowires obtained on PDMS replica of DVD structure. Inset: image of perpendicular cut by FIB milling (scale bar: 100 nm) (c) XRD patterns of $MAPbBr_3$ nanowires and of $MAPbBr_3$ film structure. (d) FESEM image of $MAPbBr_3$ synthesized on PDMS template replica of a CD substrate. (e) FESEM image of a transversal cut of a $MAPbBr_3$ nanowire (grown on CD-like PDMS template) by FIB milling (Sputtered Pt coating was used to cover the sample before the milling)

S4. Experimental optical set-up

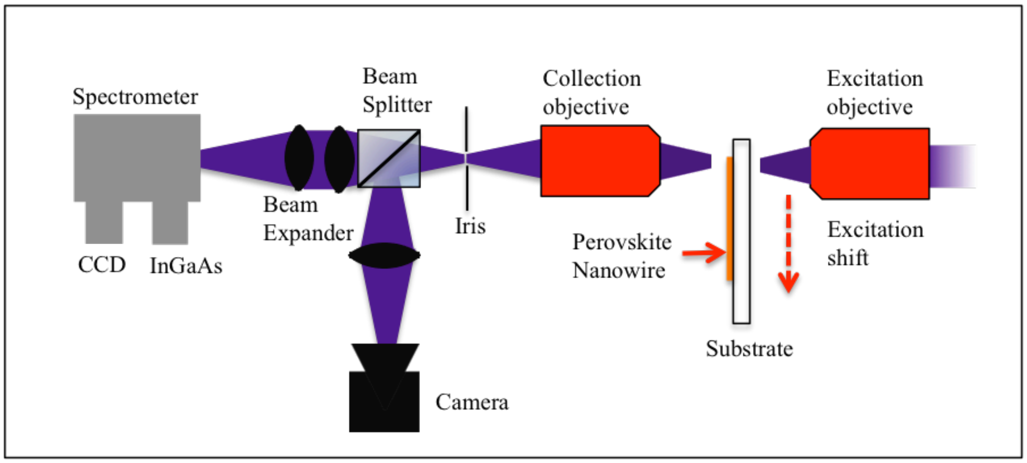

Fig. S4. Home made experimental optical setup employed for the study of photoluminescence properties and the light transport phenomenon in single Perovskite nanowires. While the collection objective is focused at one end of the nanowire, the position of the excitation objective is shifted along it.

S5. $CsPbBr_3$ nanowires grown on PDMS CD-like substrate. Photoluminescence evolution along the nanowires as function of distance between excitation and collection point.

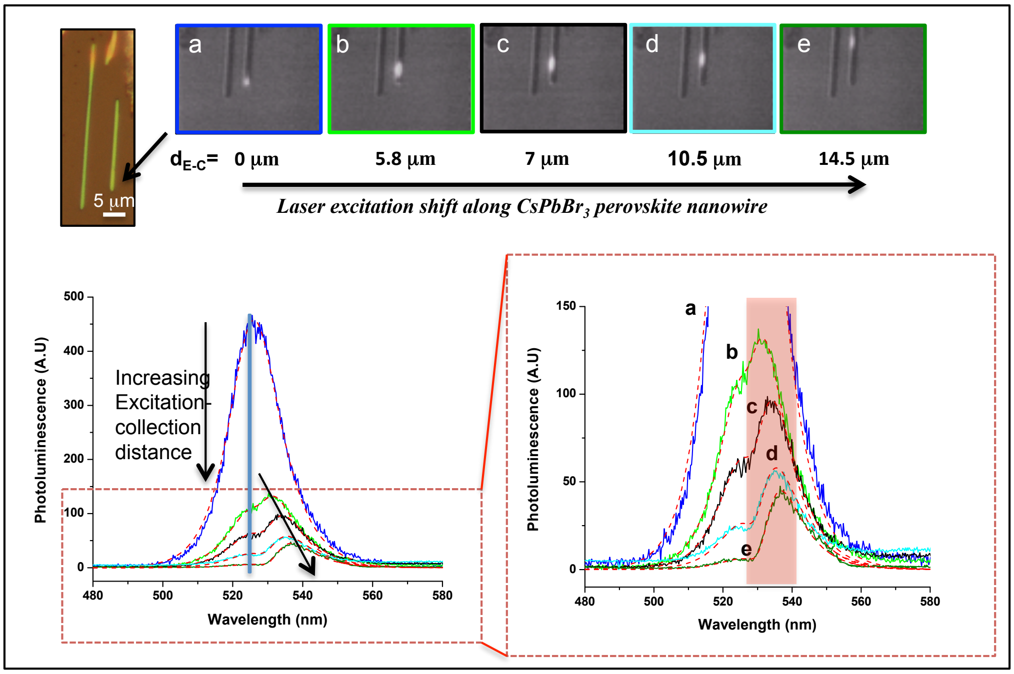

Fig. S5: Same as Fig. 4 but for $CsPbBr_3$ Perovskite nanowires prepared over a PDMS substrate with CD replica features. Top left: color optical microscope image of 2 isolated $CsPbBr_3$ nanowires. The black arrow indicates the chosen nanowire for PL experiments. Images a, b, c, and d show the nanowire with the spot of the excitation light (white spot) for each d_{E-C} distance.

Below left: Photoluminescence spectrum for each d_{E-C} distance (blue: 0 µm; light green: 5.8 µm; black: 7 µm; cyan: 10.5 µm; green: 14.5 µm). The Blue line indicates the position of the peak of the primary emission of the PL. Black arrow on the PL spectra shows the shift of the maximum peak of PL that can be seen more easily on the zoom out of the figure (below right) The red fringe indicate the PL maximum

S6. Photoluminescence spectra of $CsPbBr_3$ and $MAPbBr_3$ films

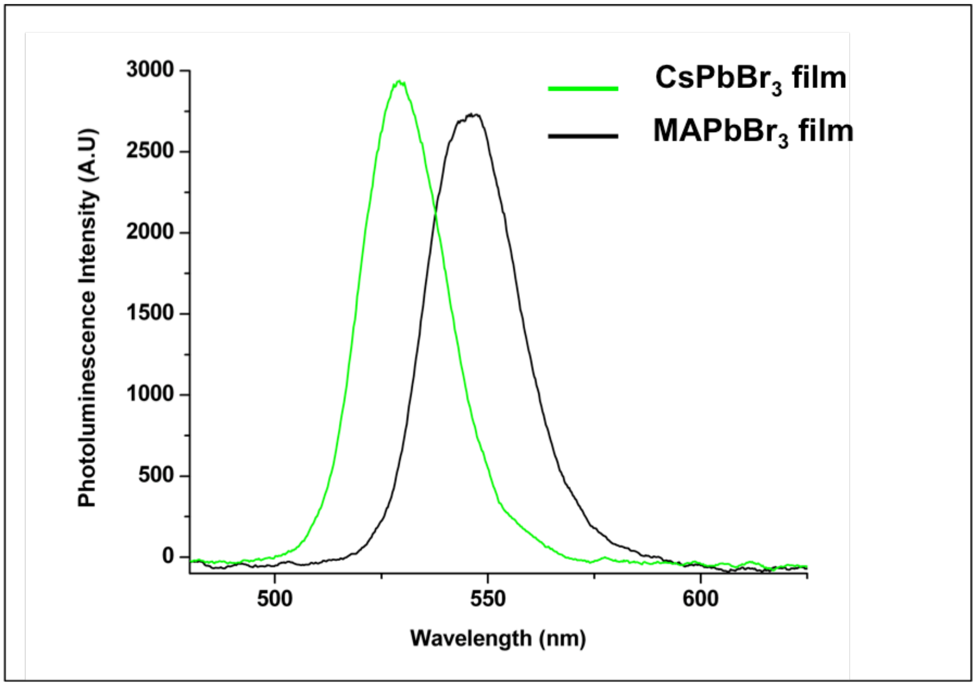

Fig. S6: Photoluminescence spectra recorded on a $CsPbBr_3$ (green line) and $MAPbBr_3$ (black line) film. The maximum peaks are centered respectively at 530 nm and 546 nm for $CsPbBr_3$ and $MAPbBr_3$

S7. Optical properties of $MAPbBr_3$ nanowires

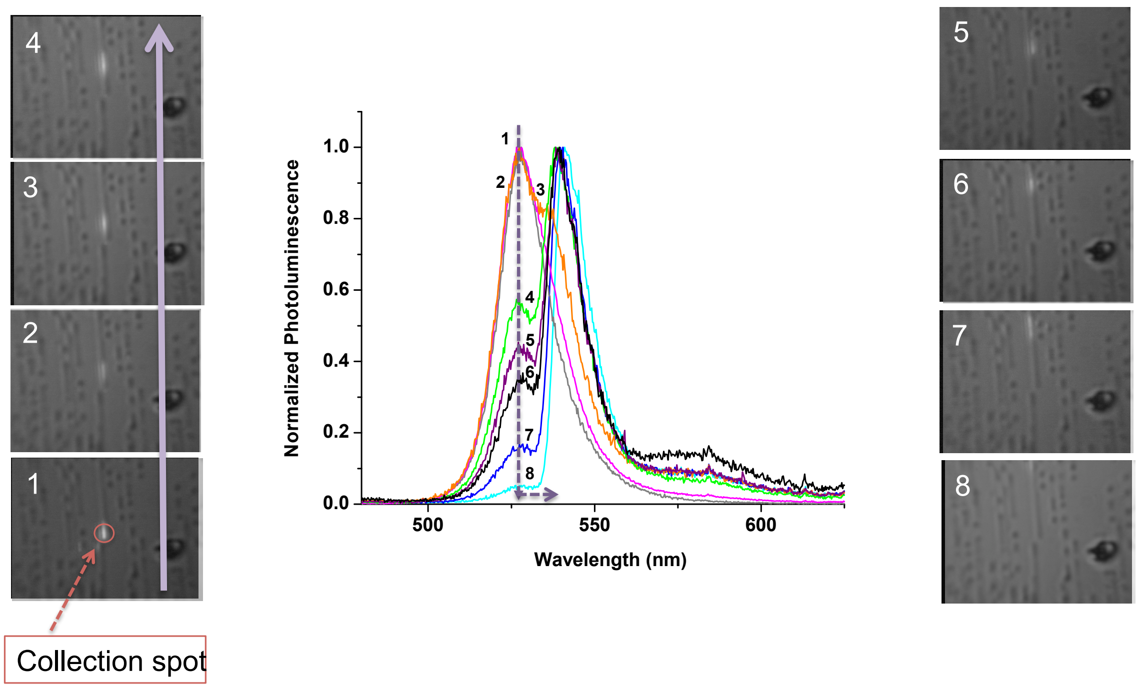

Fig. S7. Photoluminescence evolution as increasing collection-excitation distance (labels 1 to 8) for $MAPbBr_3$ nanowire obtained into the groove of a PDMS replica of DVD substrate. The white spots represent the PL induced by a 405 nm laser excitation.

S8. Optical images of transferred $MAPbBr_3$ nanowires onto ITO substrate

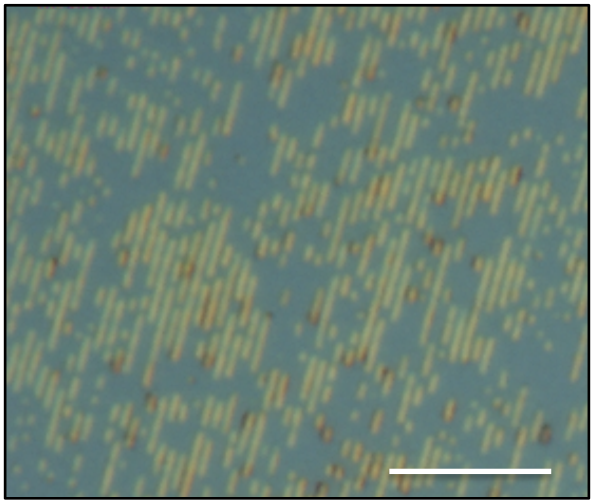

Fig. S8. $MAPbBr_3$ nanowires grown on DVD-like PDMS template transferred onto ITO substrate via gel-pack film. Scale bar: 10μm

Reference:

1S Q. Zhu, K. Zheng, M. Abdellah, A. Generalov, D. Haase, S. Carlson, Y. Niu, J. Heimdal, A. Engdahl, M. E. Messing, T. Pullerits, S. E. Canton, *Phys. Chem. Chem. Phys.* 2016, **18**, 14933