Supporting Information

Room-Temperature Processed Films of Colloidal Carved Rod-Shaped Nanocrystals of Reduced Tungsten Oxide as Interlayers for Perovskite Solar Cells

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Figure S1. Low magnification SEM images of WO_{3-x} films spin-casted on glass substrates from colloidal suspensions before (a) and after (b) AcOH washing only, (c) UV irradiation only, and (d) combined AcOH /UV treatment, evidencing a crack-free morphology. Scan bars are 200 nm. In the inset, a high- magnification SEM zoom of the samples, scale bar are 50 nm.



AcOH-UV	FF	Voc	Jsc	PCE
Reverse	74	0,87	20,7	13,3
Forward	68	0,84	20,6	11,9

WO _{3-x}	FF	Voc	Jsc	PCE
UV	70	0,76	9,4	5,0
AcOH	71	0,85	11,7	7,1
AcOH-UV	74	0,87	20,7	13,3

Figure S2. a) J/V curves of forward (from -0.4V to 1.0V) and reverse (from 1.0V to -0.4V) scans for the champion devices based on ITO/WO_{3-x}/MAPbI₃/PC₆₀BM/LiF-Al incorporating AcOH-UV WO_{3-x} layer. b) Solar-cell figures of merit for devices incorporating UV-, AcOH or AcOH-UV-treated WO_{3-x} layers: V_{OC} (V), J_{SC} (mA/cm²), FF, and PCE (%).



Figure S3. Solar-cell figures of merit for devices based on ITO/WO_{3-x}/MAPbI₃/PC₆₀BM/LiF-Al incorporating UV- and AcOH-treated WO_{3-x} layers with increasing thicknesses (from 1 to 4 layers, each layer was ~20 nm thick): V_{OC} (V), J_{SC} (mA/cm²), FF, and PCE (%).



Figure S4. Time-resolved PL decay of a PMMA-covered perovskite films, deposited either on glass (black trace), or on an AcOH-treated (orange trace), UV-treated (purple trace) and AcOH/UV-treated WO_{3-x} CNR layer (blue trace). The PL was collected at a wavelength of 780 nm after excitation at 635 nm. Inset: steady-state PL spectra of the corresponding perovskite films deposited on glass (black solid trace), on AcOH-treated WO_{3-x} (orange solid trace), on UV-treated WO_{3-x} (purple dash-dot trace) and on AcOH/UV-treated WO_{3-x} layer (blue dash trace).

Table S1. Summary of the exponential fitting parameters for the PL decays in Figure S3. The PL decay can be fitted to a bi-exponential function with two characteristic time constants: τ_1 and τ_2 .

	τ 1 (ns)	τ2 (ns)
No HTM	10.0 (9,2%)	79.5 (90.8%)
WO _{3-x} (AcOH)	2.9 (13.1%)	45.6 (86.9%)
WO _{3-x} (UV)	4.7 (15.2%)	43.4 (84.8%)
WO _{3-x} (AcOH-UV)	5.1 (20.8%)	42.8 (79.2%)