

Low-temperature and Solution-processed Vanadium Oxide as Hole Transport Layer for Efficient and Stable Perovskite Solar Cells

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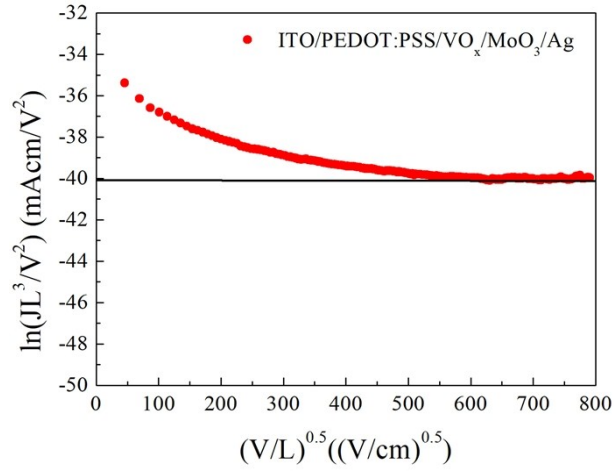


Figure S1. Current-voltage data of SCLC single-hole device (ITO/PEDOT:PSS(35nm)/VO_x(80nm)/MoO₃(10nm)/Ag(100nm)). The horizontal and vertical coordinates are plotted in formulas $\ln(JL^3/V^2)$ and $(V/L)^{0.5}$, respectively.

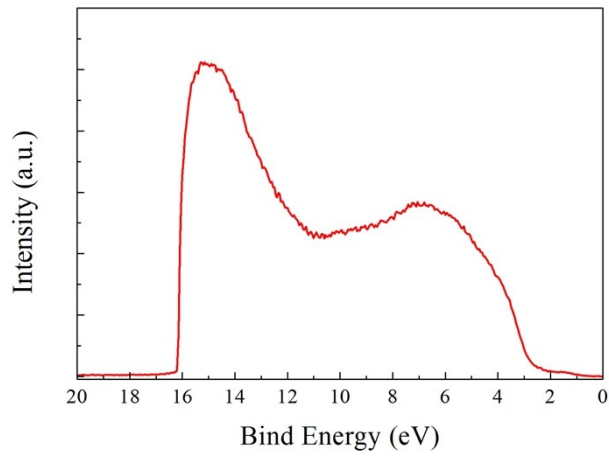


Figure S2. Complete view of the UPS spectra.

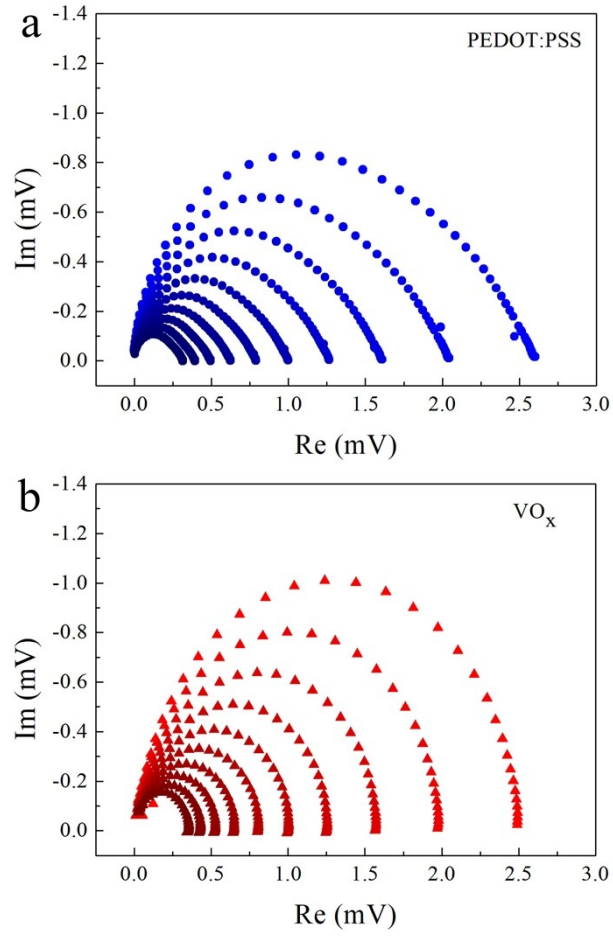


Figure S3. IMVS Nyquist plots of the PSCs with PEDOT:PSS and VO_x HTL.

Table S1. Detail fitting parameters of TRPL data

samples	A ₁ (%)	τ ₁ (ns)	A ₂ (%)	τ ₂ (ns)	τ _{avg} (ns)
CH ₃ NH ₃ PbI ₃	1.85	3.60	98.15	174.10	170.94
PEDOT:PSS/CH ₃ NH ₃ PbI ₃	65.56	0.51	34.44	18.91	6.84
VO _x /CH ₃ NH ₃ PbI ₃	51.85	0.69	48.15	16.30	8.20

$$\tau_{avg} = \sum_i A_i \tau_i, \text{ where } \sum_i A_i = 1$$