Supplementary Information

'Leaf Vein' Inspired Structural design of Cu Nanowire Electrodes for the Optimization of Organic Solar Cells

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**Figure S1**: The diameter distribution of LDL nanowires (a) and SDS nanowires (c); the length distribution of LDL nanowires (b) and SDS nanowires (d).



**Figure S2**: (a) The simulation results of the absorption cross sections of single LDL nanowire and SDS nanowire; (b) The simulation results of the scattering cross sections of single LDL nanowire and SDS nanowire



**Figure S3**: (a) The illustration of the transportation of electrons in a LDL network; (b) The illustration of the transportation of electrons in a SDS network.



**Figure S4**: The corresponding SEM images of the nanowire electrodes processed with Image-pro plus: (a) the hybrid electrodes composed of 27 wt% LDL nanowires and 73 wt% SDS nanowires (the H1 electrode); (b) the hybrid electrode composed of 63 wt% LDL nanowires and 37 wt% SDS nanowires (the H2 electrode).



Figure S5: AFM images of LDL NW electrodes on a silicon wafer (a) and a polyacrylate substrate (b).



**Figure S6**: The SEM images of a hybrid nanowire network composed of 25% LDL nanowires and 75% SDS nanowires



**Figure S7**: (a) The illustration of the transportation of electrons in a LDL network; (b) The illustration of the transportation of electrons in a hybrid network.



**Figure S8**: The corresponding C-AFM images of the nanowire electrodes processed with Image-pro plus: (a) the SDS nanowire electrode; (b) the hybrid electrodes composed of 27 wt% LDL nanowires and 73 wt% SDS nanowires (H1 electrodes); (c) the hybrid electrode composed of 63 wt% LDL nanowires and 37 wt% SDS nanowires (H2 electrodes); (d) the LDL nanowire electrode.

**Table S1:** The average and standard deviation of the parameters of OSCs based on different nanowire electrodes: SDS nanowire electrodes; Hybrid electrodes composed of 27 wt% LDL nanowires and 73 wt% SDS nanowires (H1 electrodes); Hybrid electrodes composed of 63 wt% LDL nanowires and 37 wt% SDS nanowires (H2 electrodes) and LDL nanowire electrodes.

Samples	Voc/V	Jsc/(mA·cm <sup>-2</sup> )	FF/%	PCE/%
SDS	0.594±0.002	6.40±0.07	38.51±0.7	1.433±0.129
H1	0.588±0.003	7.99±0.025	49.45±0.41	2.326±0.016
H2	0.608±0.0004	6.98±0.03	47.6±0.871	2.02±0.033
LDL	0.589±0.0008	6.68±0.06	47.9±0.651	1.94±0.01



**Figure S9**: The changes of PCE (a), current density (b), fill factor (c) and open-circuit voltage of flexible organic solar cells based on Cu NW electrodes (H1 NW electrodes) and ITO/PET during the bending test.