Supporting Information

Anisotropic, Mesoporous Microfluidic Frameworks with Scalable, Aligned Cellulose Nanofibers

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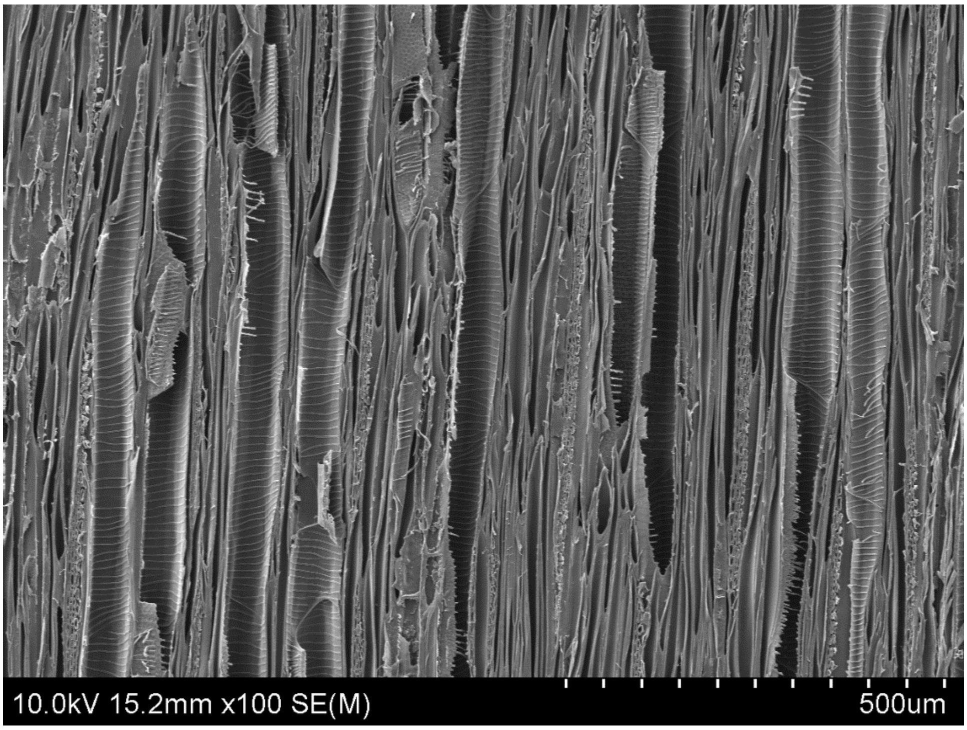

Figure S1. SEM image of original basswood. The microchannels possess low tortuosity and high alignment along the tree growth direction, and provide a rapid and efficient path for water and mass.

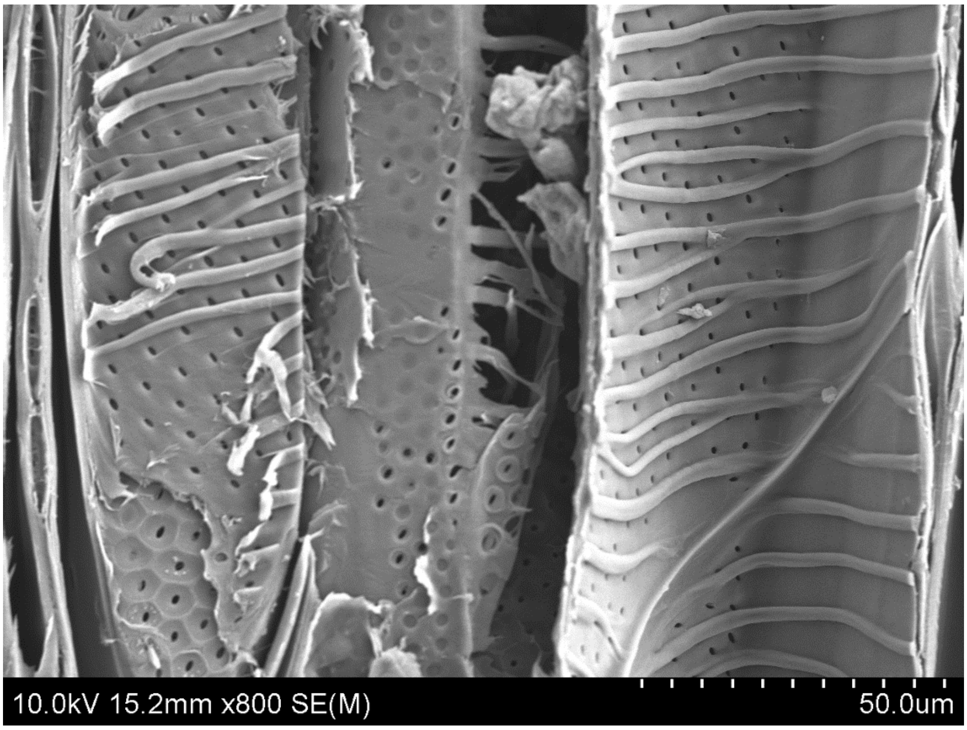

Figure S2. SEM image of the wood microchannels. There are some small pits on the internal surface of the channels. These pits enable mass transport between adjacent channels.

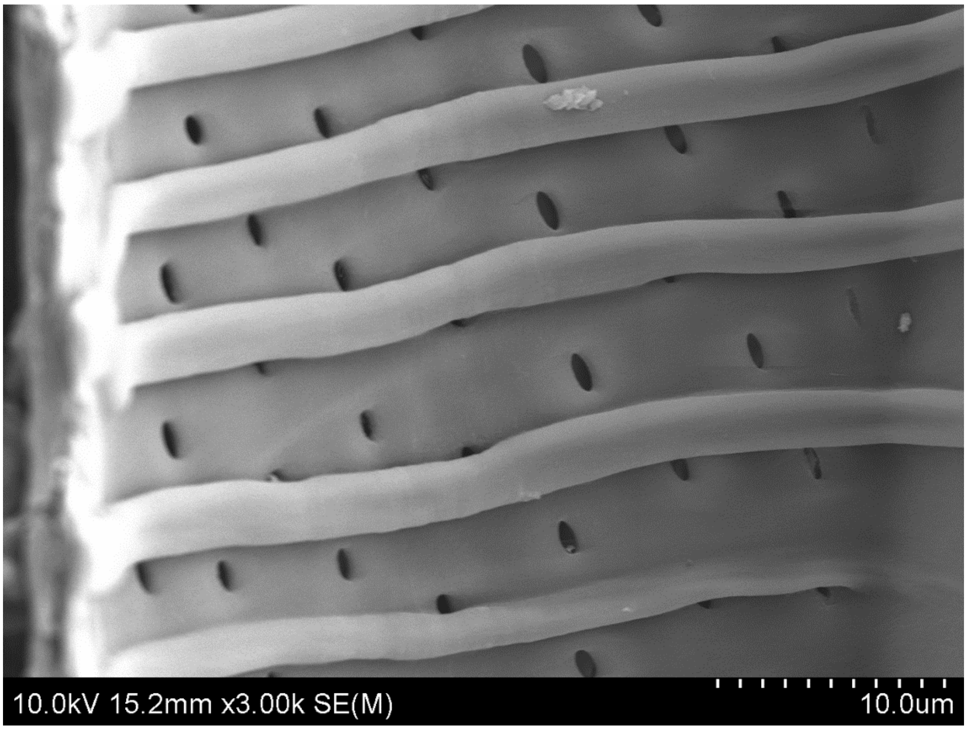

Figure S3. SEM image of the small pits on the internal surface of the channels. These pits enable mass transport between adjacent channels.

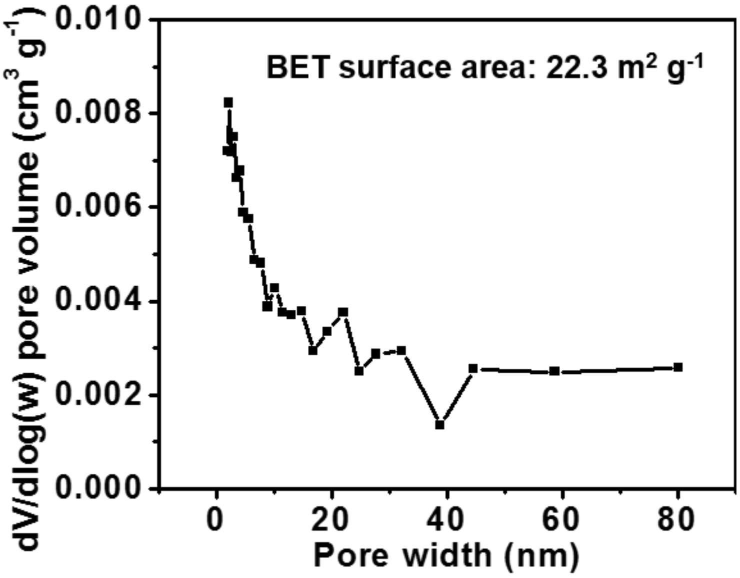

Figure S4. BET pore size distribution of white wood. Note that the white wood possesses a BET surface area of 22.3 m^2 g^{-1}, and most pores are distributed in the 2-30 nm range, falling into the category of mesopores (2-50 nm), demonstrating the white wood has a mesoporous structure.

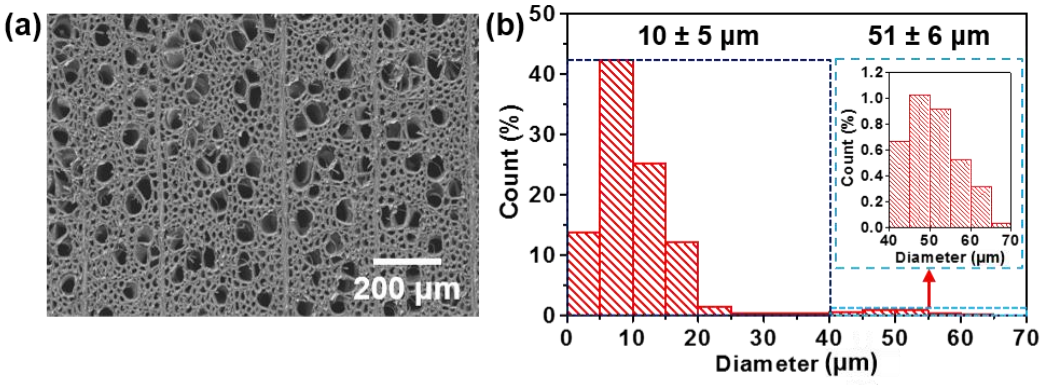

Figure S5. (a) Cross-sectional SEM image of the original wood. (b) Diameter distribution of fiber tracheids and vessels in the original wood; inset shows the enlarged section for vessel lumens diameter distribution.

Table S1. Comparison of physical properties for white wood, filter paper, and original wood.

Physical properties	White wood	Filter paper	Original wood
Density (kg m^{-3})	312	502	445
Pore diameter (μm)	Vessels: 51 ± 7 Fiber tracheids: 12 ± 6	N/A[a]	Vessels: 51 ± 6 Fiber tracheids: 10 ± 5
Pore volume fraction[b] (%)	79.2	66.5	70.3
Thickness (μm)	581 ± 23	136 ± 8	587 ± 19
Theoretical water absorption capacity[c] (g g^{-1})	2.54	1.32	1.58

[a] N/A: Not applicable.

[b] Pore volume fraction (%) = $(1 - \frac{\rho\ (\text{sample})}{\rho\ (\text{cell wall})}) \times 100\%$, where ρ (sample) denotes sample density (kg m^{-3}), ρ (cell wall) is the cell wall density, which is about 1500 kg m^{-3}.

[c] Theoretical water absorption capacity (g g^{-1}) = $\frac{\text{Pore volume fraction} \times \rho\ (\text{water})}{\rho\ (\text{sample})}$, where ρ (sample) is sample density (kg m^{-3}), ρ (water) is water density (1000 kg m^{-3}).

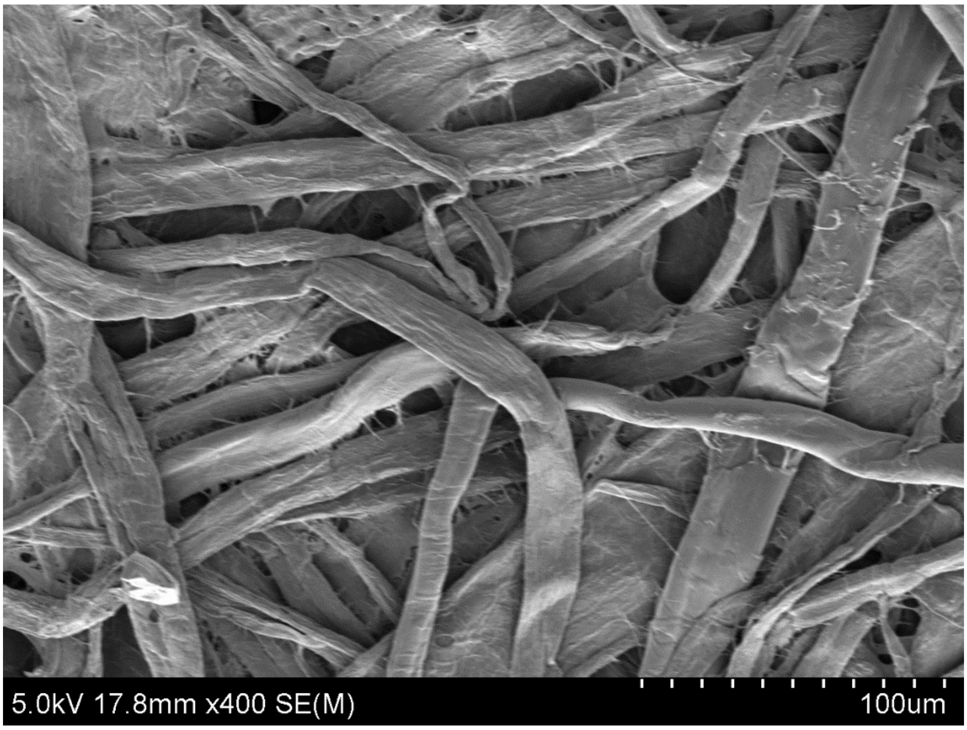

Figure S6. SEM image of filter paper. Filter paper is made of cellulose fibers, and the fibers are randomly dispersed.

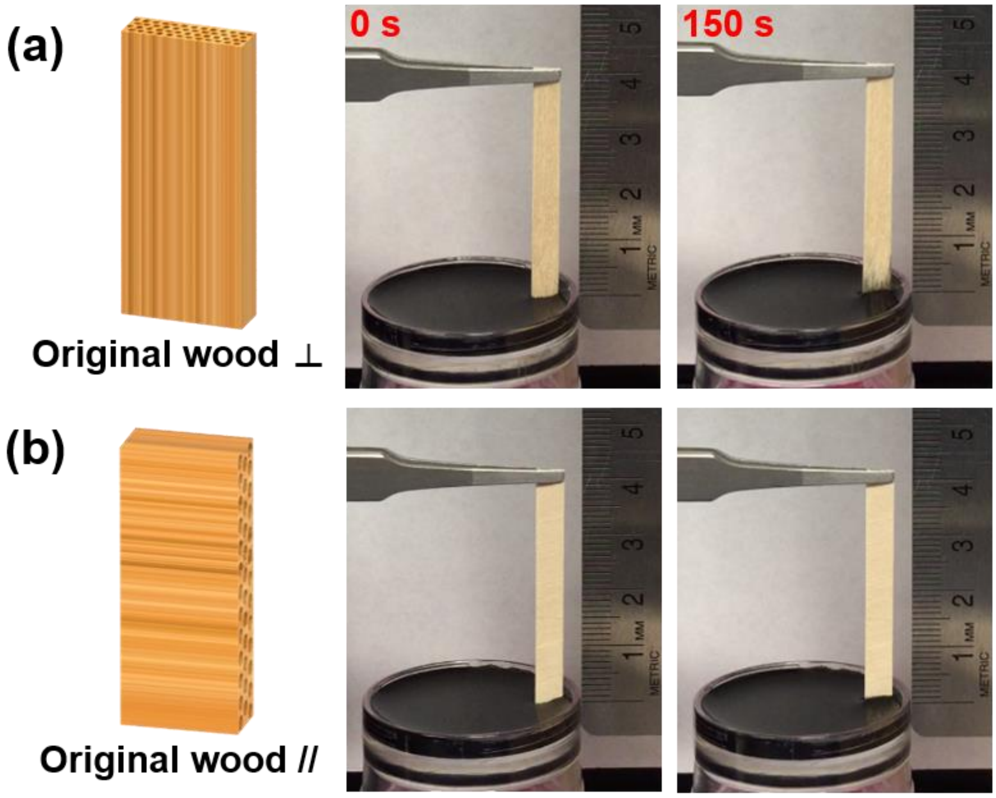

Figure S7. CNT transport in original wood. (a) CNT transport is slow in the original wood strip with vertical channels. (b) CNT transport is not observed in the original wood strip with horizontal channels due to the existence of hydrophobic lignin, closed fiber tracheids, and pit membranes.

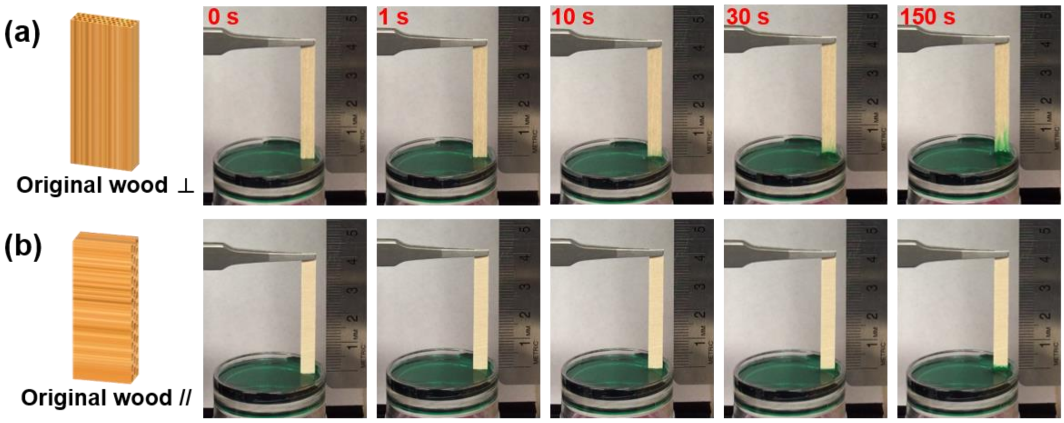

Figure S8. Water transport in original wood. (a) Water transport is slow in the original wood strip with vertical channels. (b) Water almost cannot transport in the original wood strip with horizontal channels due to the existence of hydrophobic lignin, closed fiber tracheids, and pit membranes.