

Electronic Supplementary Information

Hydrogen-bonding-induced assembly of aligned cellulose nanofibers into ultrastrong and tough bulk materials

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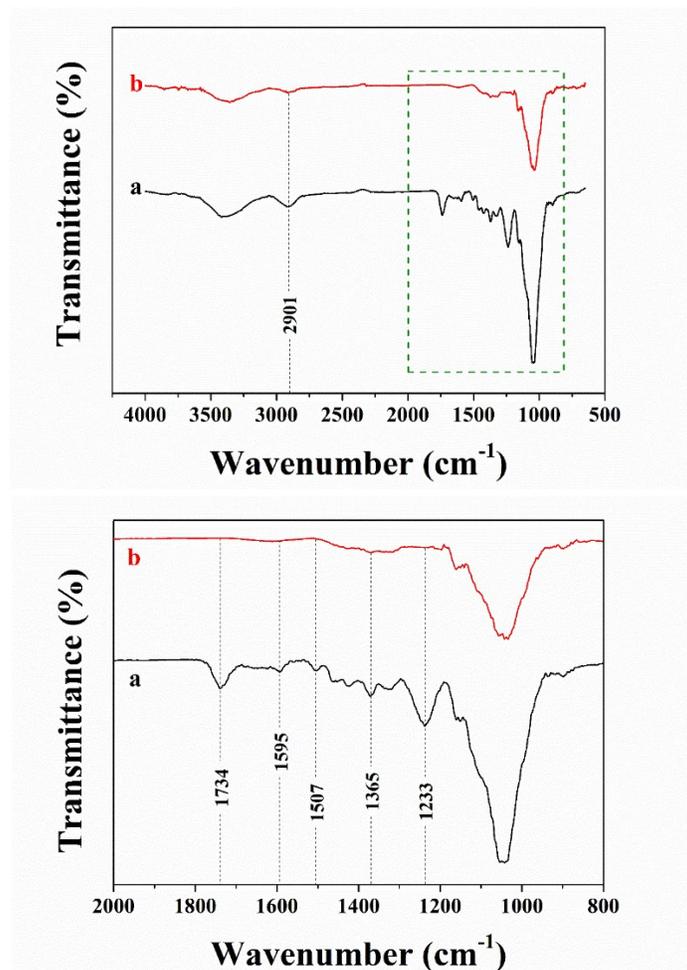


Fig. S1. FTIR spectra of natural wood (a) and delignified wood (b). The basswood was delignified with sodium chlorite and sodium hydroxide, removing all lignin and most of hemicellulose, which can be confirmed through changes of respective peaks in the FTIR spectra. For natural wood, the presence of 1507 cm^{-1} and 1595 cm^{-1} (C-H stretching of the aromatic rings), and 1365 cm^{-1} (symmetric C-H bending from methoxyl group) represents the typical structure of lignin, while the band locating in 1233 cm^{-1} is ascribed to the C-O stretching of the aromatic rings. Furthermore, the peak at 1734 cm^{-1} is due to unconjugated carbonyl C=O in hemicellulose. It is apparent that these characteristic peaks for lignin and hemicellulose disappeared for delignified wood.

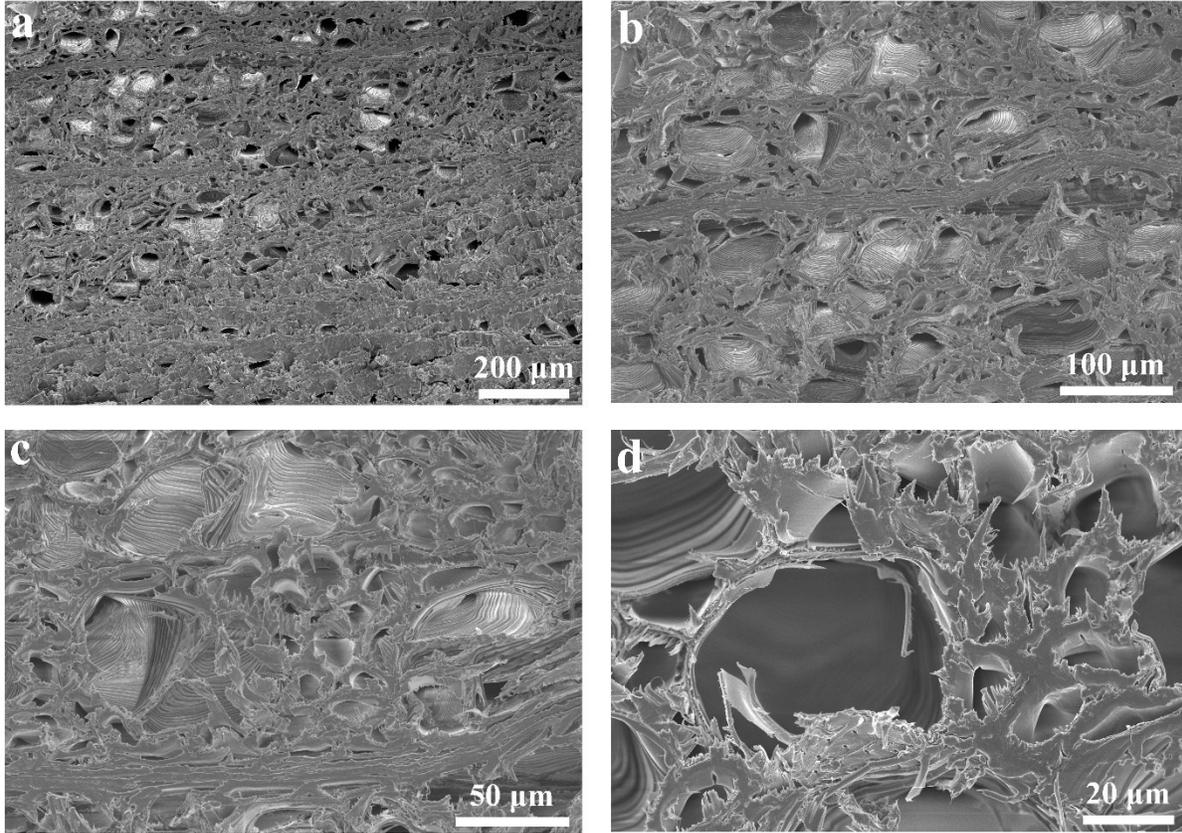


Fig. S2. SEM images of natural wood.

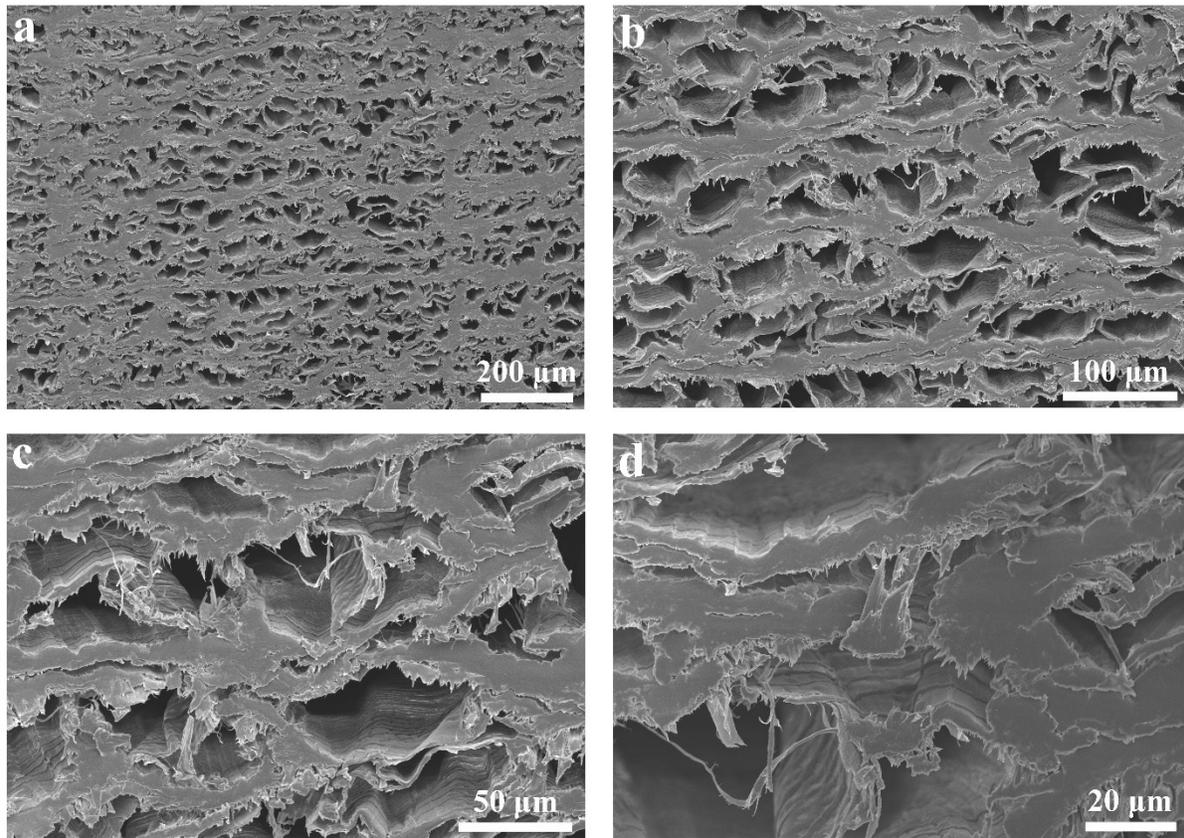


Fig. S3. SEM images of DW_{AD}.

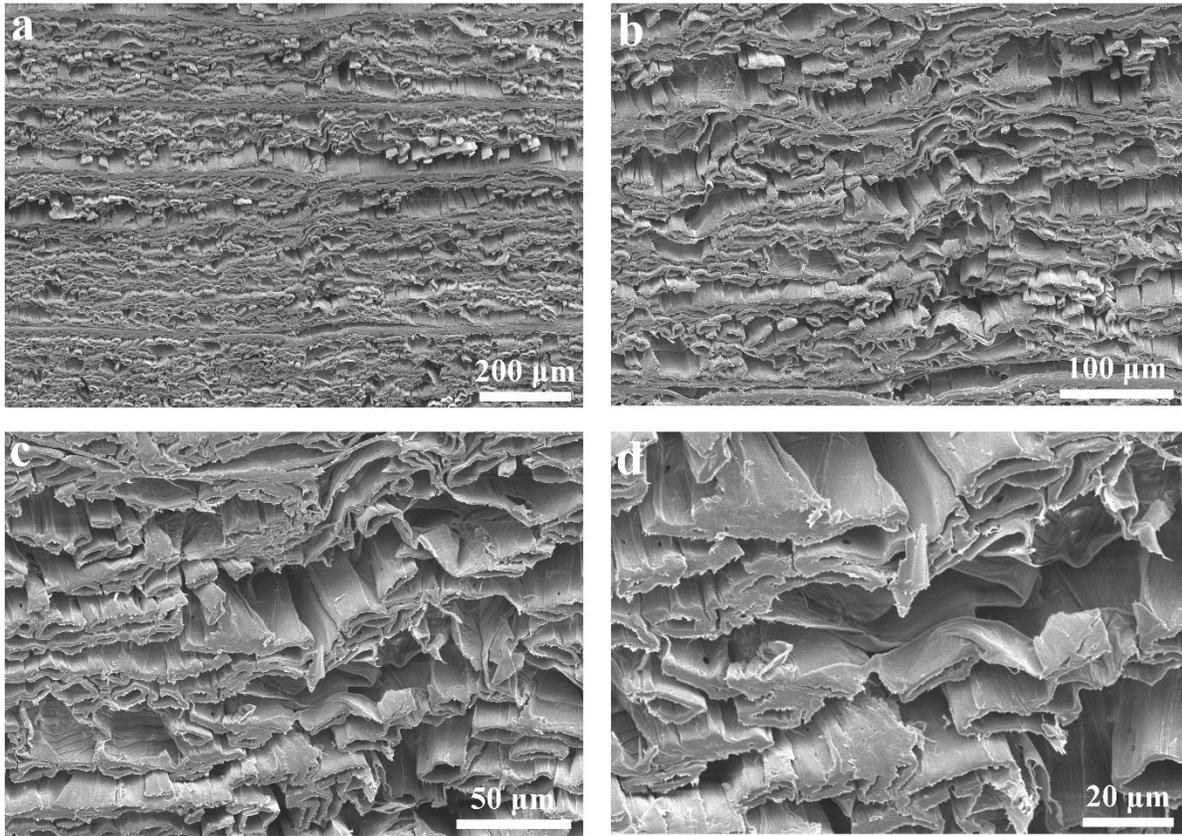


Fig. S4. SEM images of DW_{SD}.

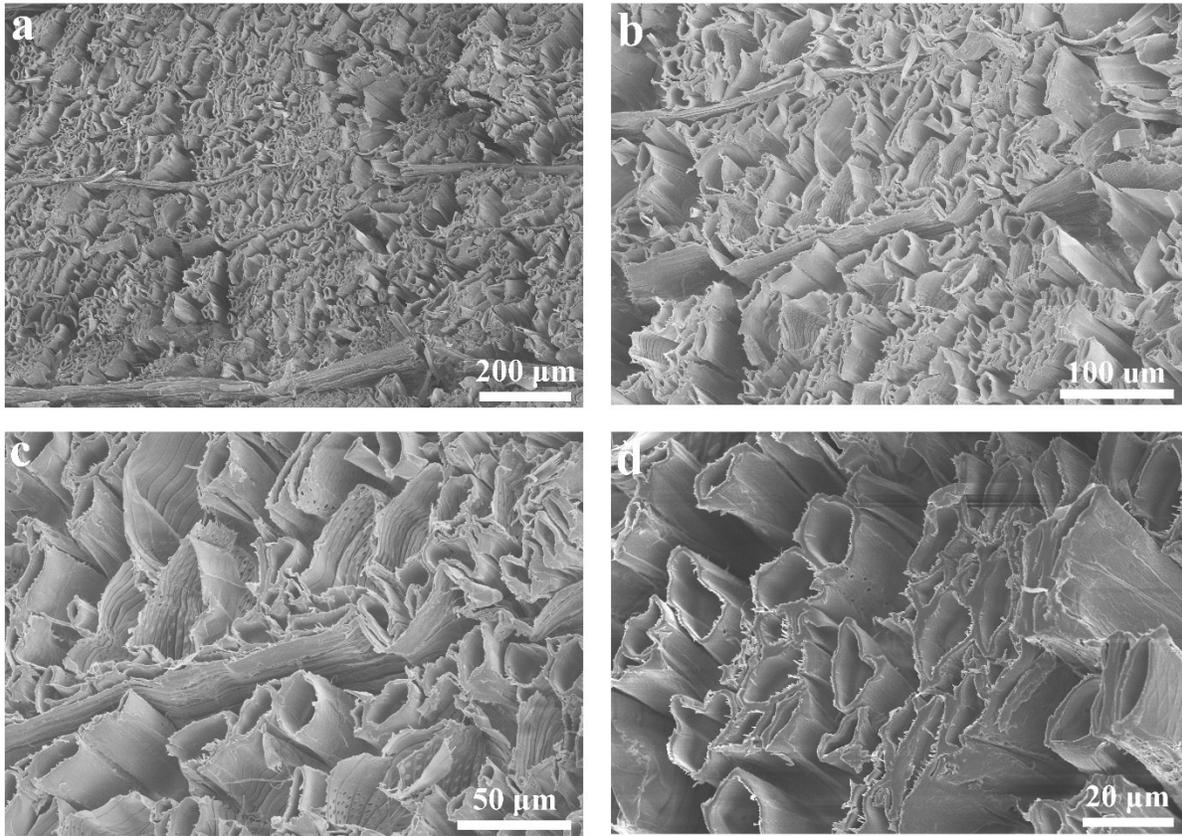


Fig. S5. SEM images of DW_{FD}.

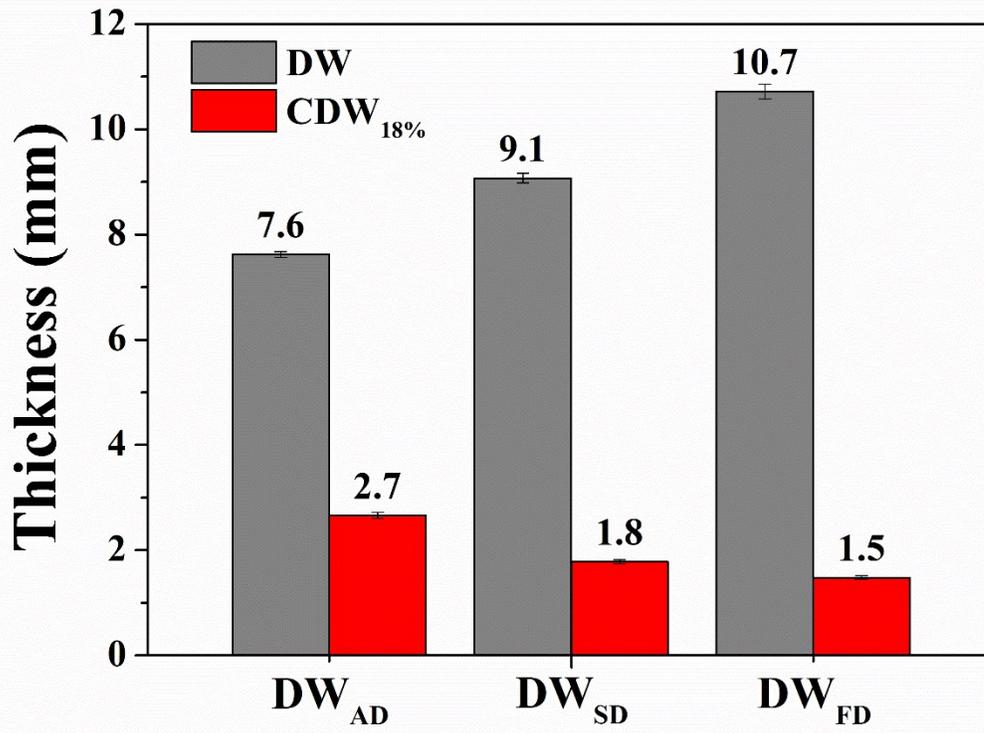


Fig. S6. Thickness values of delignified wood (DW_{AD}; DW_{SD}; and DW_{FD}) before compression and after compression under 18% moisture content.

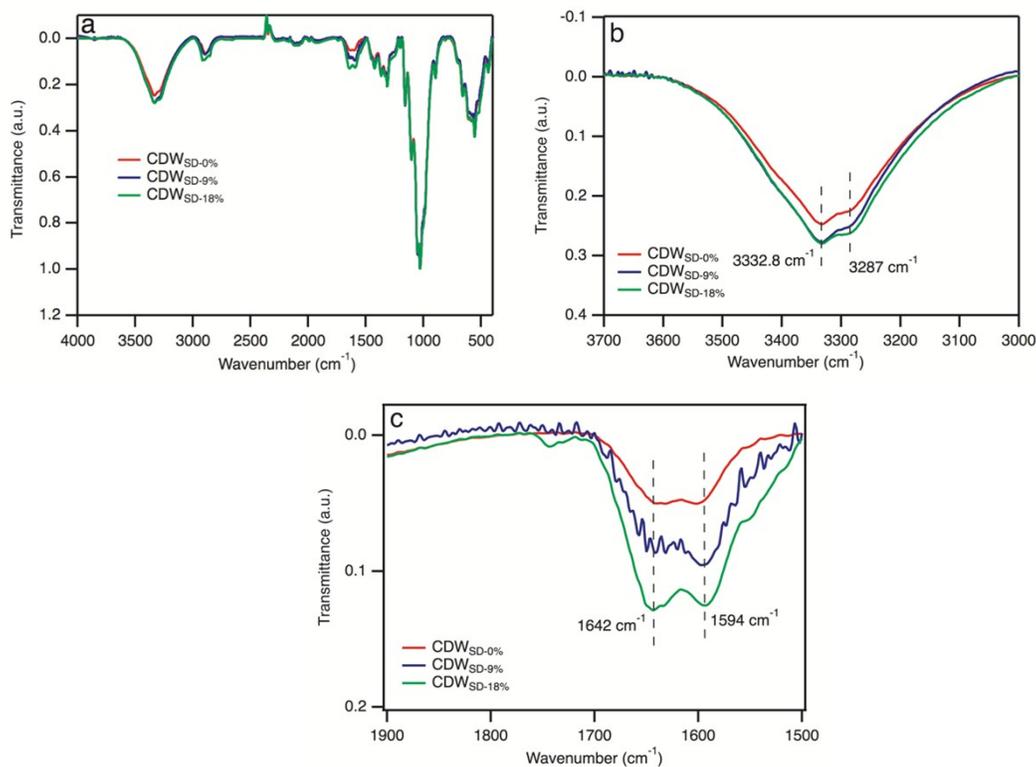


Fig. S7. FTIR spectra of CDW_{FD-0%}, CDW_{FD-9%}, and CDW_{FD-18%}. FTIR spectra of the CDW were collected using an infrared spectroscopy combined with the ATR technique (Bruker's INVENIO-S FT-IR spectrometer). The compressed wood was placed in intimate contact with the surface of an IR transmitting crystal. The spectra were collected from 400 cm⁻¹ to 4000cm⁻¹ with the resolution of 4cm⁻¹. The spectra were normalized against the peak at 1032 cm⁻¹.

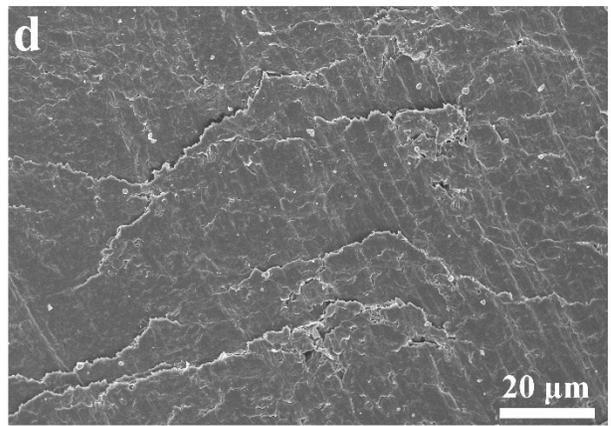
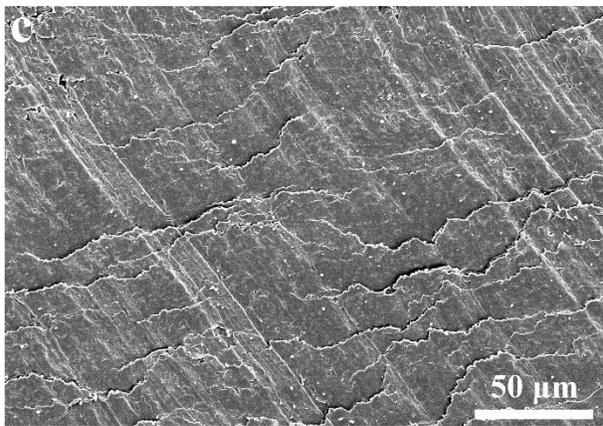
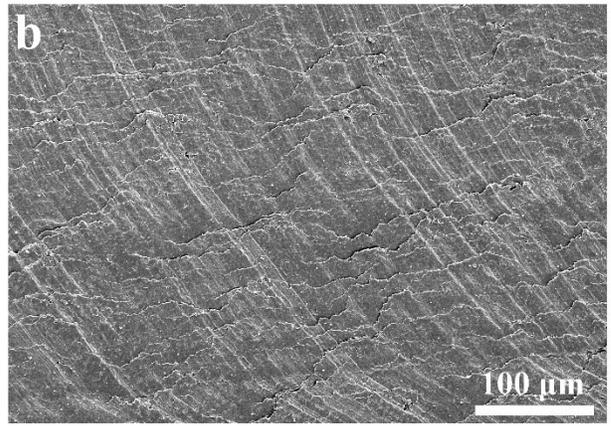
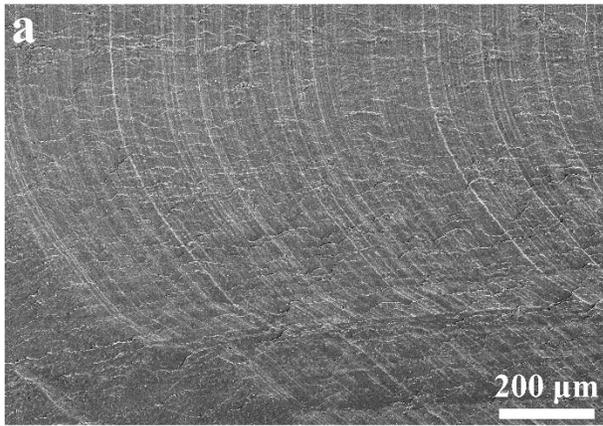


Fig. S8. SEM images of $CDW_{AD-18\%}$.

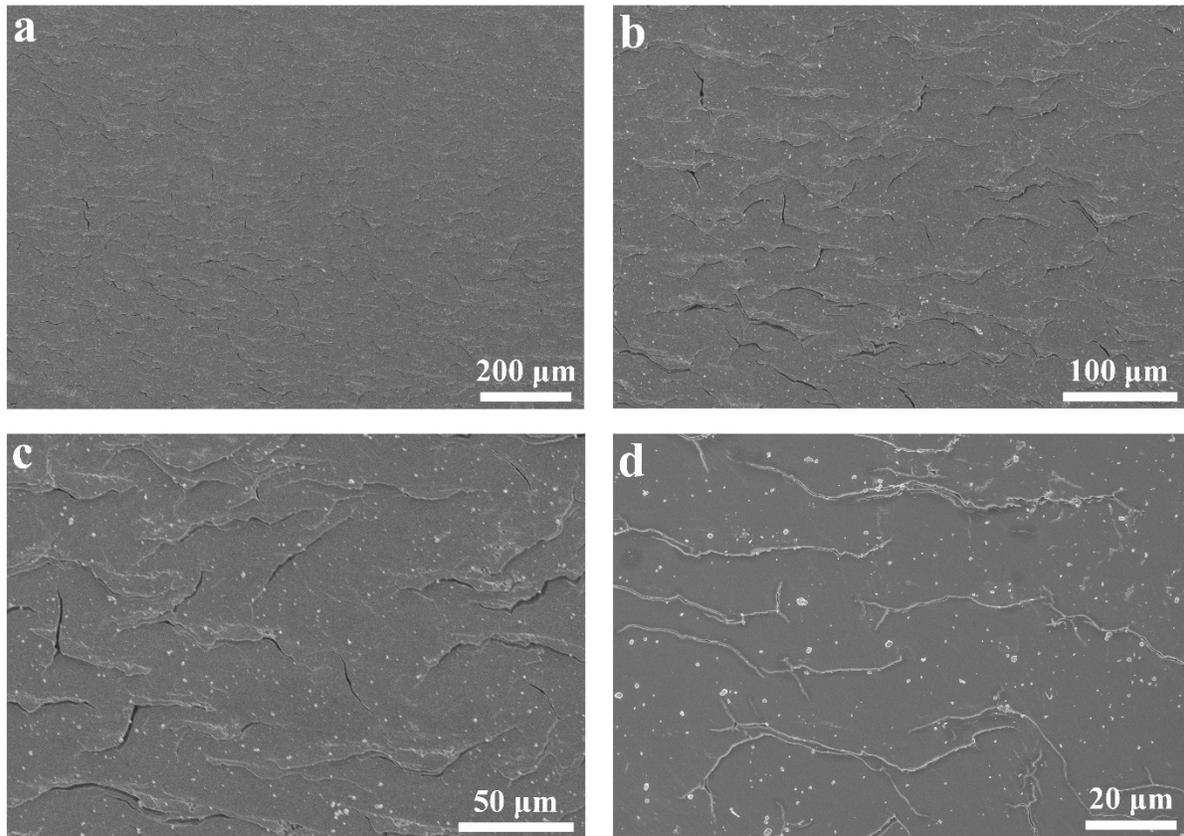


Fig. S9. SEM images of $CDW_{SD-18\%}$.

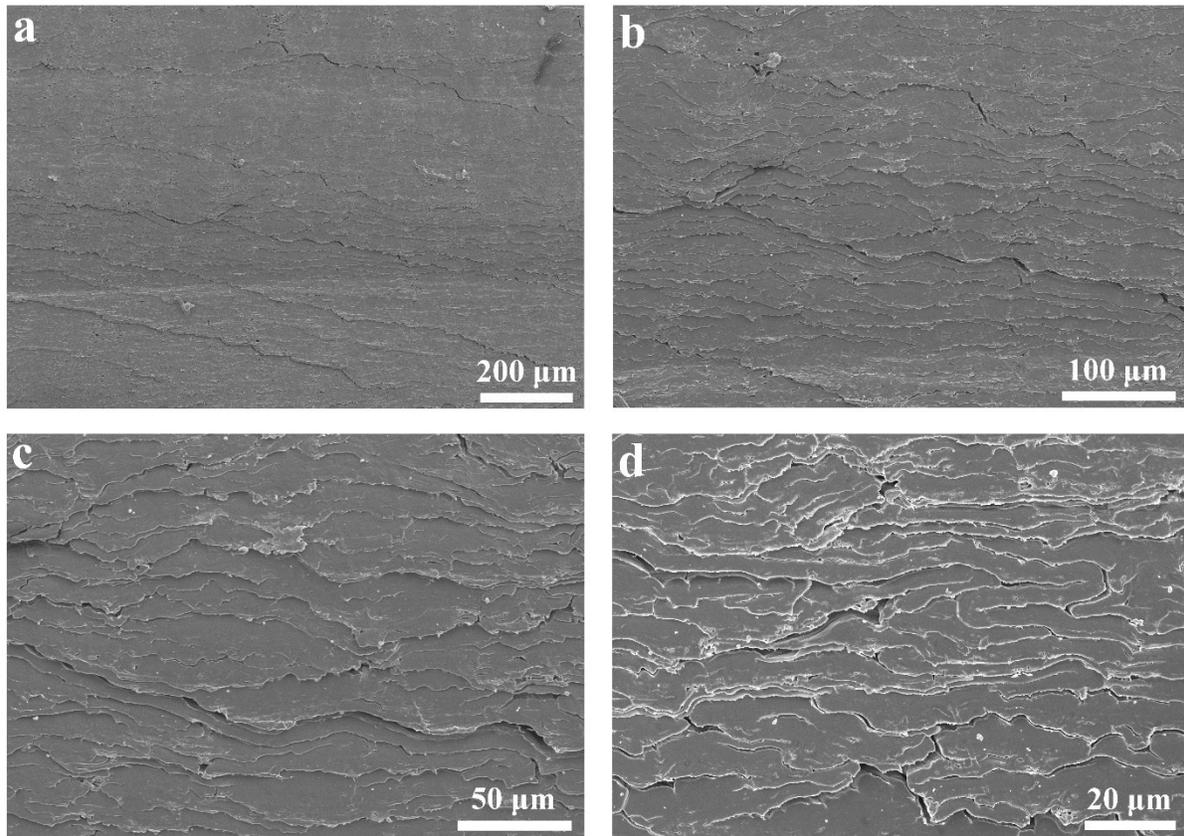


Fig. S10. SEM images of CDW_{FD-18%}.

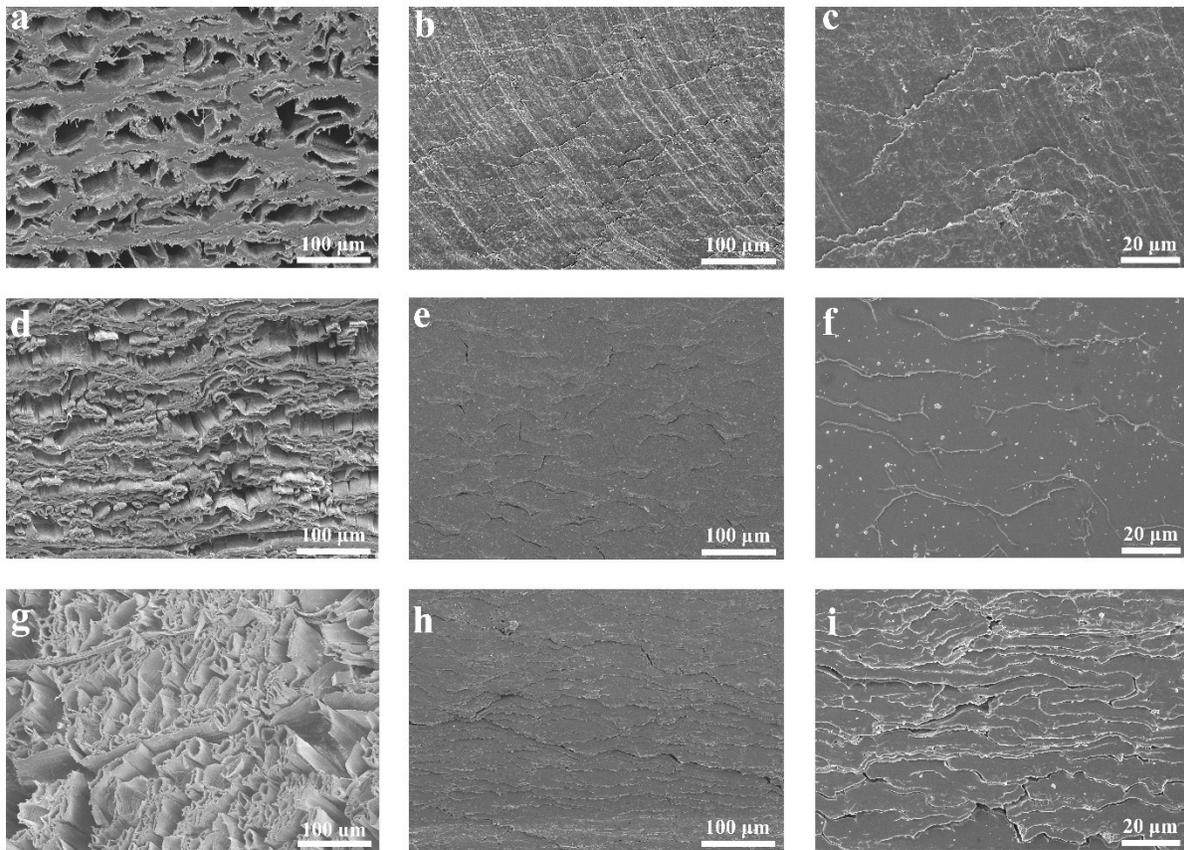


Fig. S11. SEM images of (a) DW_{AD} ; (b,c) $DW_{AD-18\%}$; (d) DW_{SD} ; (e,f) $DW_{SD-18\%}$; (g) DW_{FD} ; (h,i) $DW_{FD-18\%}$.