

Preparation and Characterization of Polyvinylpyrrolidone/Cellulose Nanocrystals Composites

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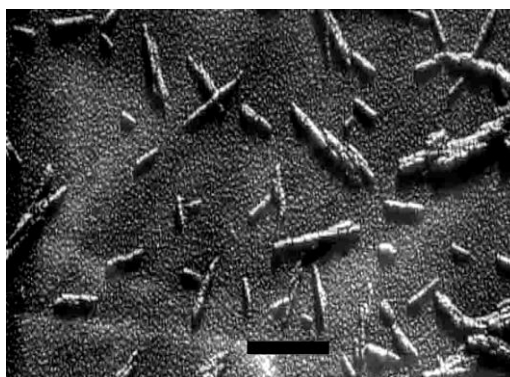


Figure S1. TEM image of CNC. The scale bar is 100 nm.

Table S1. CNC characteristics.

Parameter	CNC characteristics
¹ Dimensions, nm	
length	100–150
diameter	15–20
² Hydrodynamic diameter, nm	100
³ Total sulfur content, %	0.6
⁴ Degree of polymerization	80
⁵ Crystallinity index, %	84.0
⁵ Crystalline dimension by (200) plane, nm	4.0

¹ TEM. ² DLS. ³ Elemental analysis. ⁴ In terms of viscosity of CNC solution in cadoxene. ⁵ X-ray diffractational analysis.

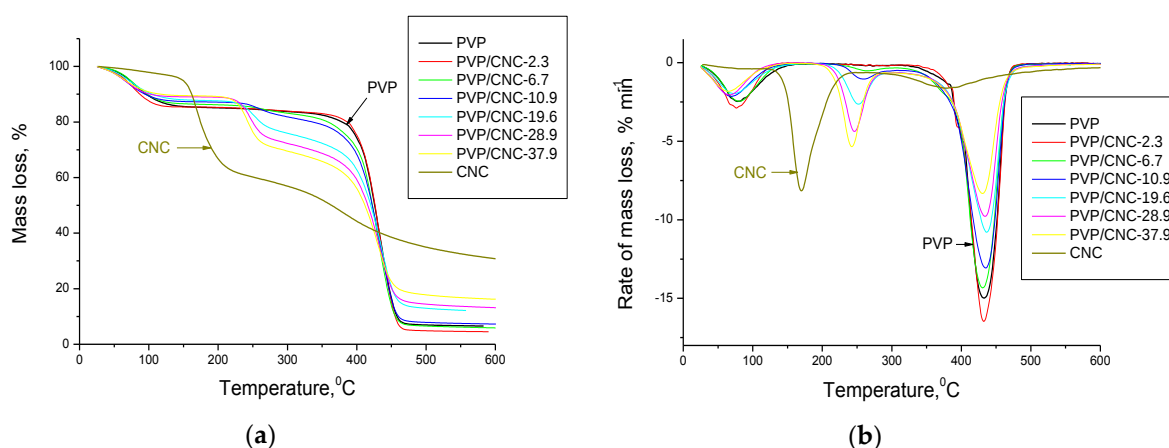


Figure S2. TG (a) and DTG (b) curves of the PVP/CNC composite films.

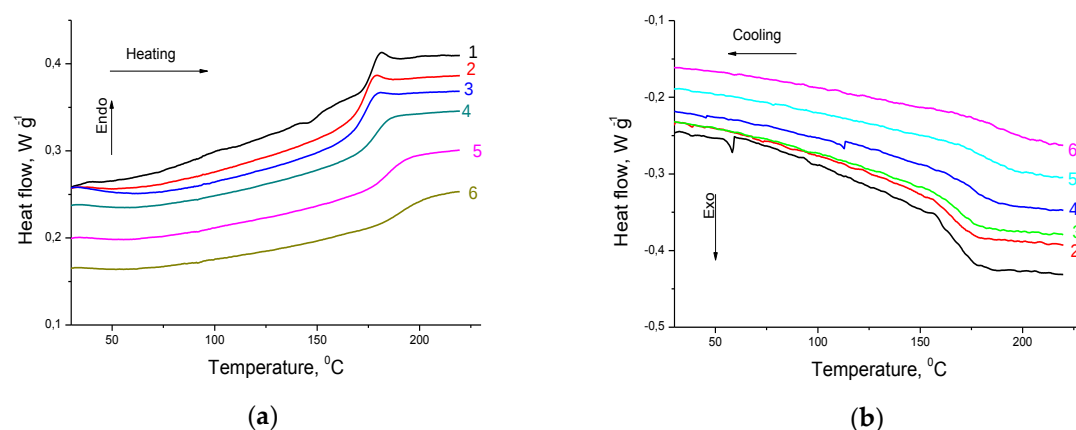


Figure S3. DSC traces for heating (a) and cooling (b) of the PVP/CNC composite films: 1 - neat PVP; 2 - PVP/CNC-4.6; 3 - PVP/CNC-10.9; 4 - PVP/CNC-19.6; 5 - PVP/CNC-28.9; 6 - PVP/CNC-37.9.

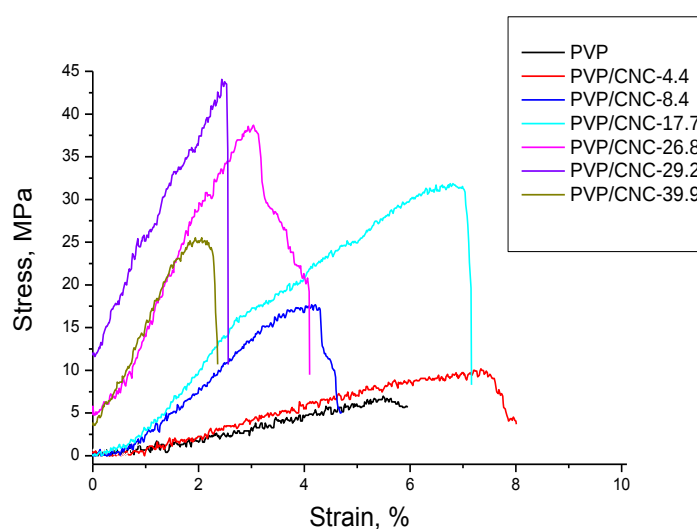
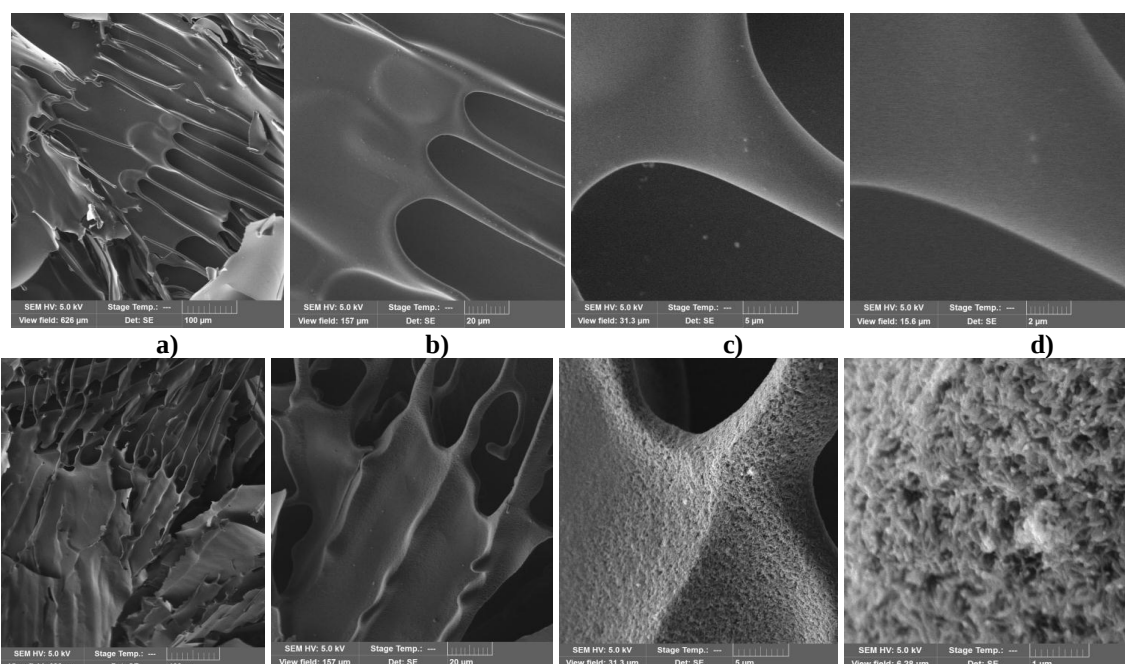


Figure S4. Typical stress-strain curves of the PVP/CNC composite films.



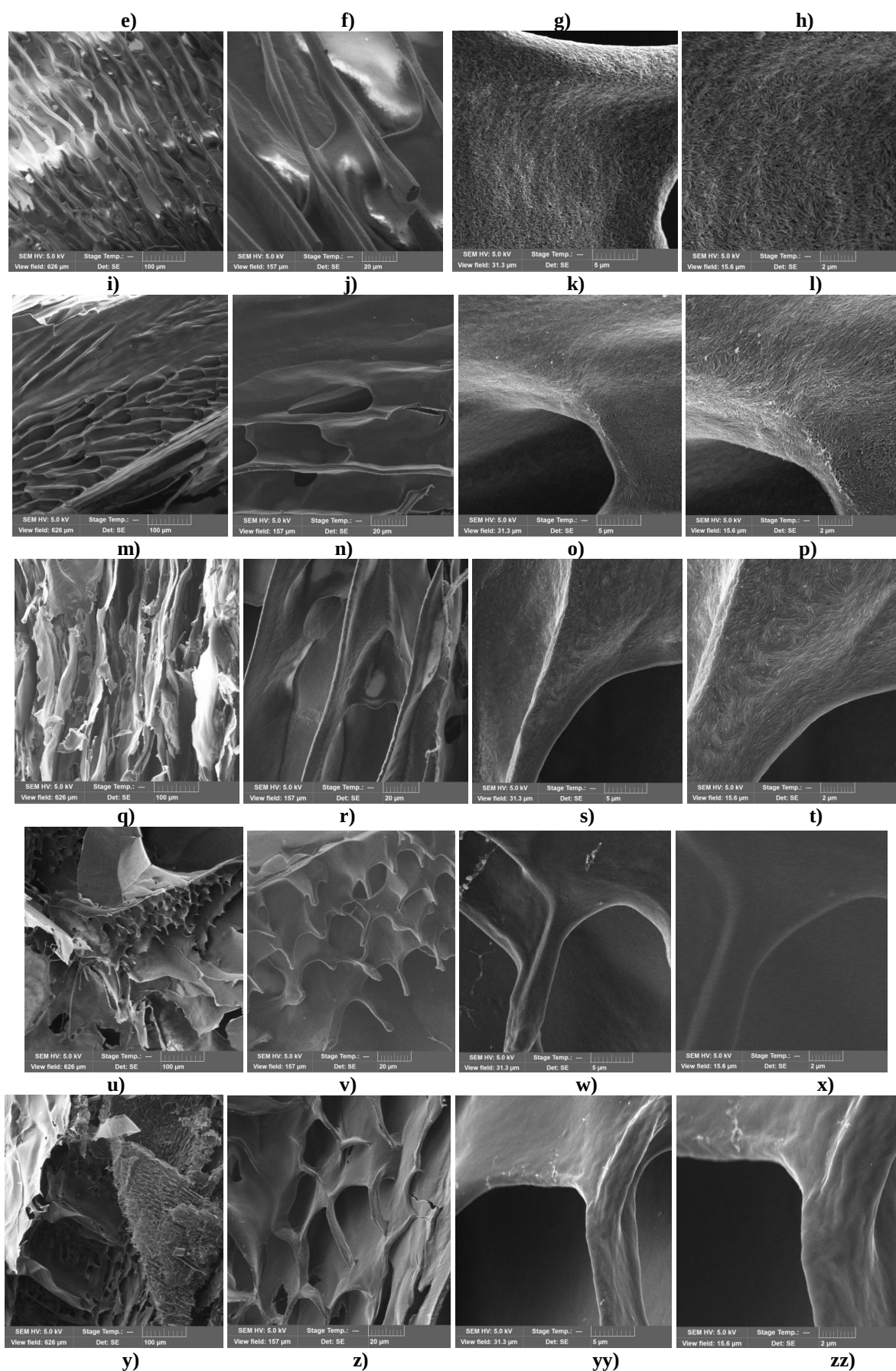
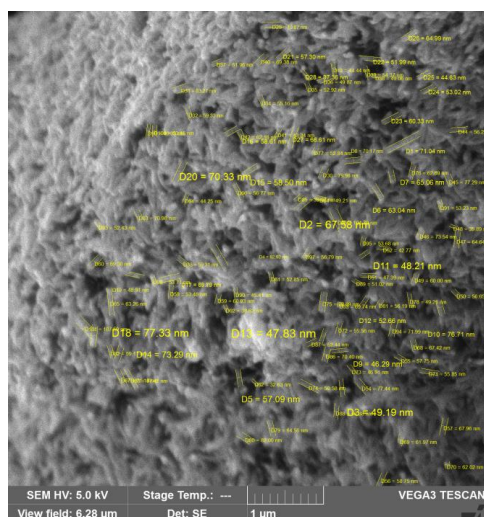
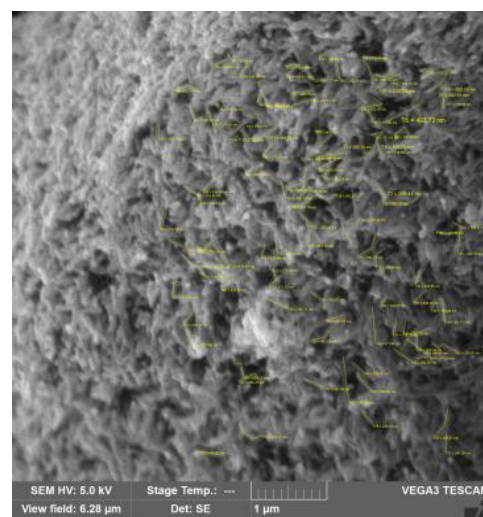


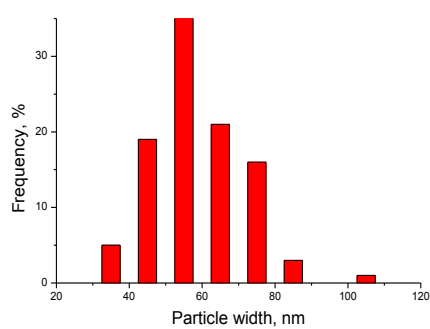
Figure S5. SEM images of the neat PVP aerogel (a-d) and the PVP/CNC composite aerogels with CNC content (wt.%) of: 4.6 (e-h); 10.9 (i-l); 19.6 (m-p); 28.9 (q-t), 54.5 (u-x); 70.6 (y-zz), respectively. Scales: 100 μm (a, e, i, m, q, u, y); 20 μm (b, f, j, n, r, v, z); 5 μm (c, g, k, o, s, w, yy); 2 μm (d, l, p, t, x, zz); 1 μm (h).



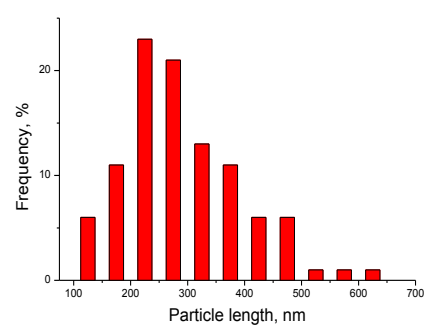
(a)



(b)

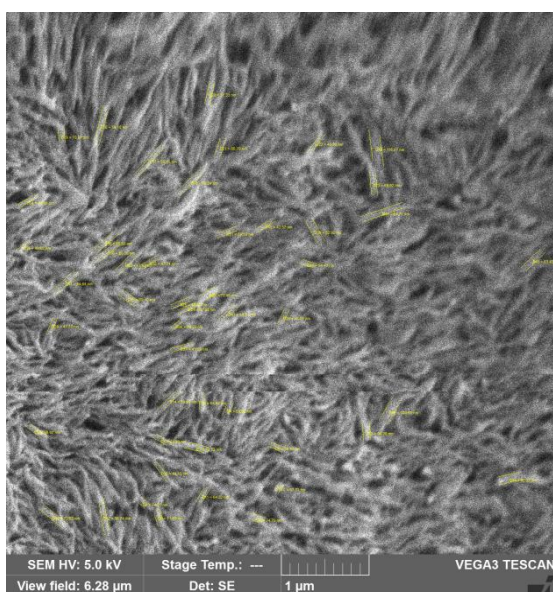


(c)

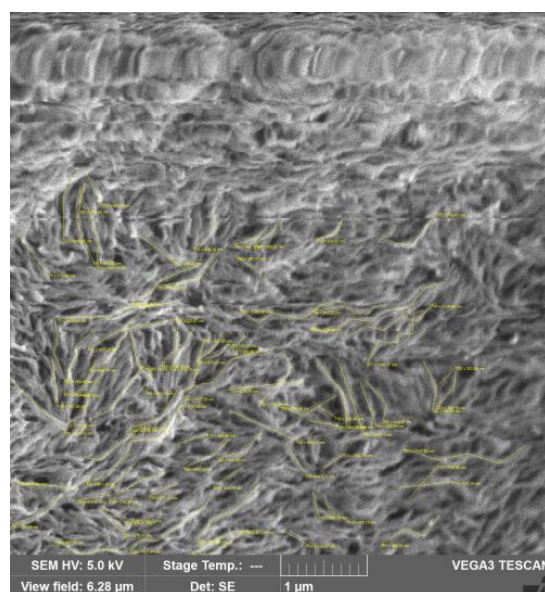


(d)

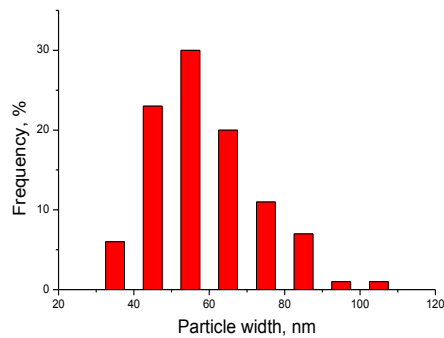
Figure S6. SEM images of the PVP/CNC-4.6 aero for CNC particle size estimation across the widths (a) and along the lengths (b). The scale bar is 1 μ m. The CNC particle size distribution across the widths (c) and along the lengths (d).



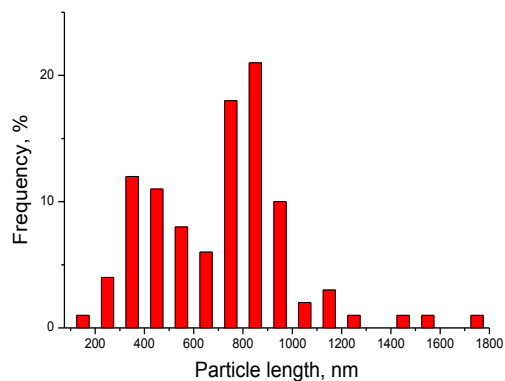
(a)



(b)

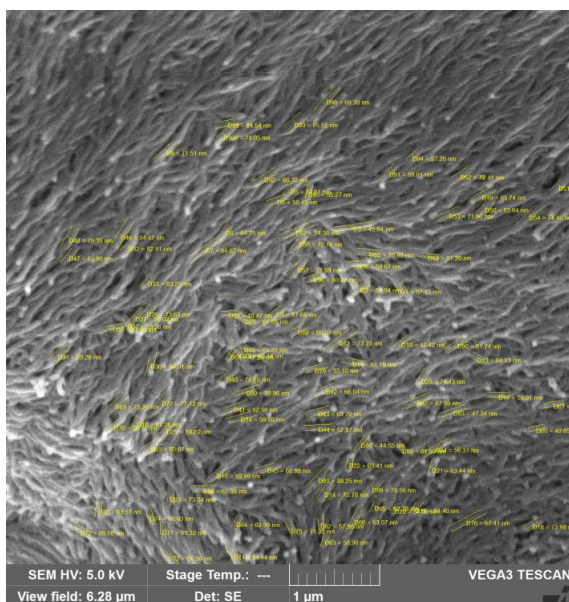


(c)

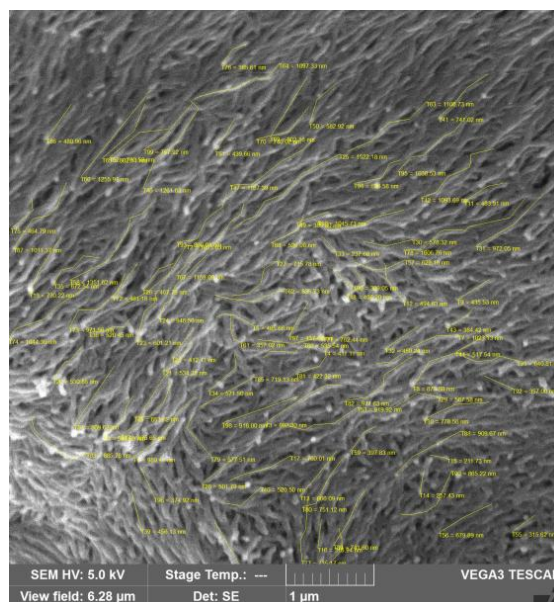


(d)

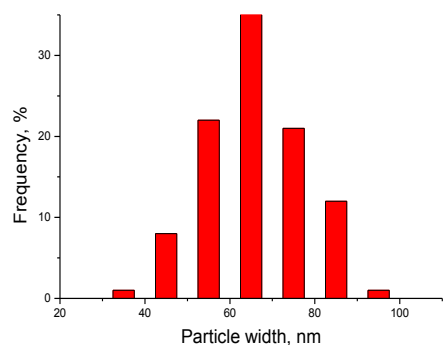
Figure S7. SEM images of the PVP/CNC-10.9 aero for CNC particle size estimation across the widths (a) and along the lengths (b). The scale bar is 1 μm . The CNC particle size distribution across the widths (c) and along the lengths (d).



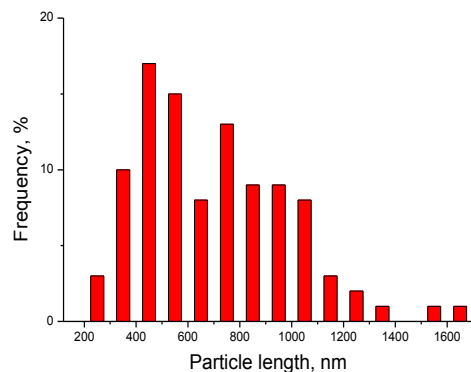
(a)



(b)

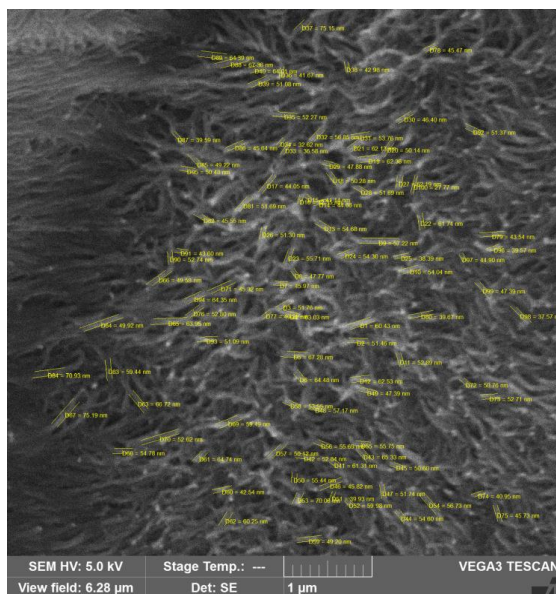


(c)

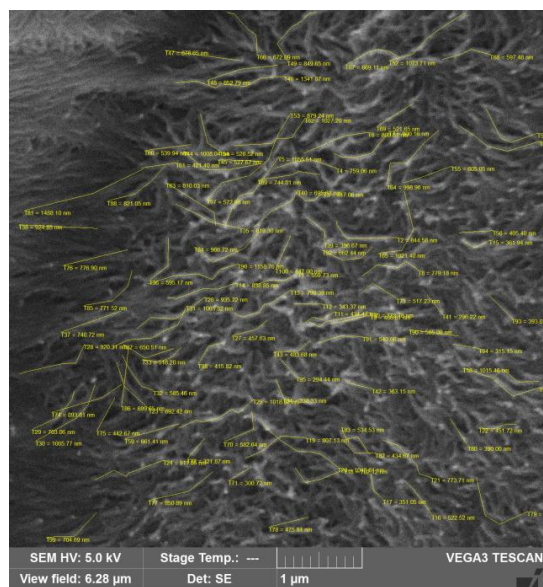


(d)

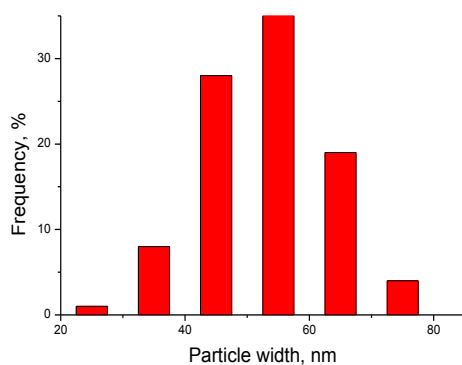
Figure S8. SEM images of the PVP/CNC-19.6 aero for CNC particle size estimation across the widths (a) and along the lengths (b). The scale bar is 1 μm . The CNC particle size distribution across the widths (c) and along the lengths (d).



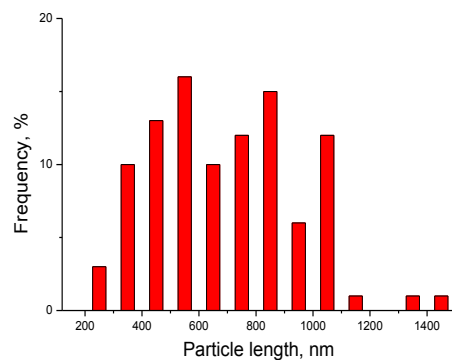
(a)



(b)



(c)



(d)

Figure S9. SEM images of the PVP/CNC-28.9 aero for CNC particle size estimation across the widths (a) and along the lengths (b). The scale bar is 1 μm . The CNC particle size distribution across the widths (c) and along the lengths (d).

Water



Immediately after redispersion



After 10 days



After a month

Propanol



Immediately after redispersion



After 3 days



After 10 days

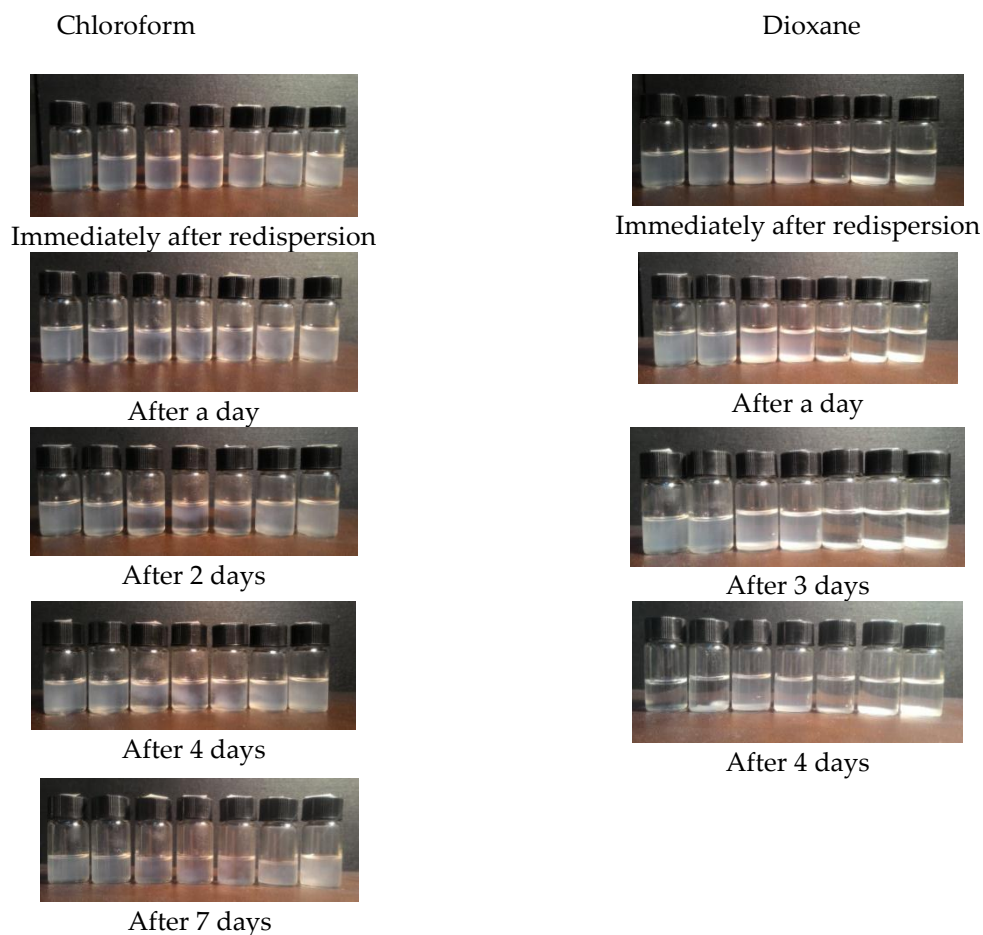


Figure S10. Photos of the redispersed suspensions during storage. From the left to the right: PVP/CNC-4.6 aero; PVP/CNC-10.9 aero; PVP/CNC-16.3 aero; PVP/CNC-19.6 aero; PVP/CNC-28.9 aero; PVP/CNC-37.9 aero; PVP/CNC-54.5 aero. The CNC concentration in the suspensions is 0.2 wt.%.

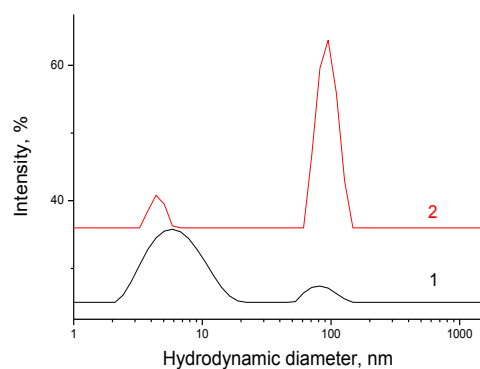


Figure S11. PVP particles size distribution in propanol (1) and chloroform (2) (the solution concentration is 0.2 wt.%).