Electronic Supplementary Material (ESI) for RSC Advances.


**Supporting Information for**

# Electrospun nanofibrous composites of polystyrene and cellulose nanocrystals: manufacture and characterization

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## Preparation of spinning solution with different conditions

### Different solvent combinations

PS particles were dissolved in the mixture of DMF and THF at the ratio of 3:1, 1:1 and 1:3 under vigorous magnetic stirring at room temperature for 12 h to obtain a 20 wt% concentrated PS solution with different solvent combinations. The isolated CNCs and NSM were added into prepared PS solution and agitated for 12 h before electrospinning. The CNC loading percentage in relation to the adding weight of PS was chosen as 7%.

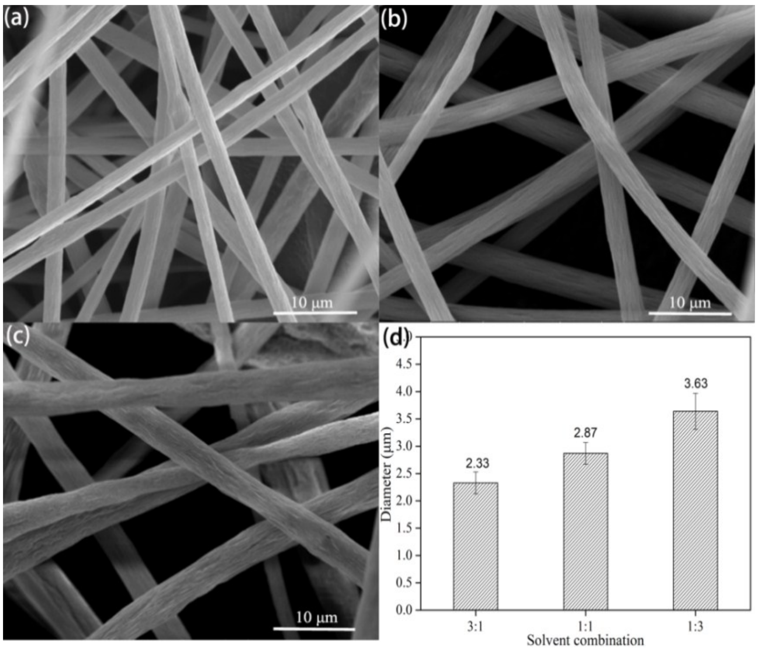


**Figure S1 SEM images of electrospun nanofibrous mats with different DMF and THF combinations when the electrospinning voltage was 15kV, solution concentration was 20 wt%, and the addition of CNC was 7 wt%. (a) 3:1 (b) 1:1 (c) 1:3 (d) Average diameter of nanofibers**

In Figure S1, it is shown that homogeneous smooth nanofibers with 2.33 μm could be produced with 3:1 of DMF/THF. As the ratio was increased to 1:1, nanofibers diameter were slightly increased to 2.87 μm. However, when the ratio was changed to 1:3, the inhomogeneous nanofibers with largest diameter of 3.64μm were obtained.

### Different solution concentrations

Different amounts of PS particles were dissolved in the mixture of DMF and THF at the ratio of

1:3 under vigorous magnetic stirring at room temperature for 12 h to obtain spinning solution with different PS concentrations (15 wt%, 20 wt% and 25 wt%). The isolated CNCs and NSM were added into PS solution and agitated for 12 h before electrospinning. The CNC loading percentage in relation to the adding weight of PS was chosen as 7%.

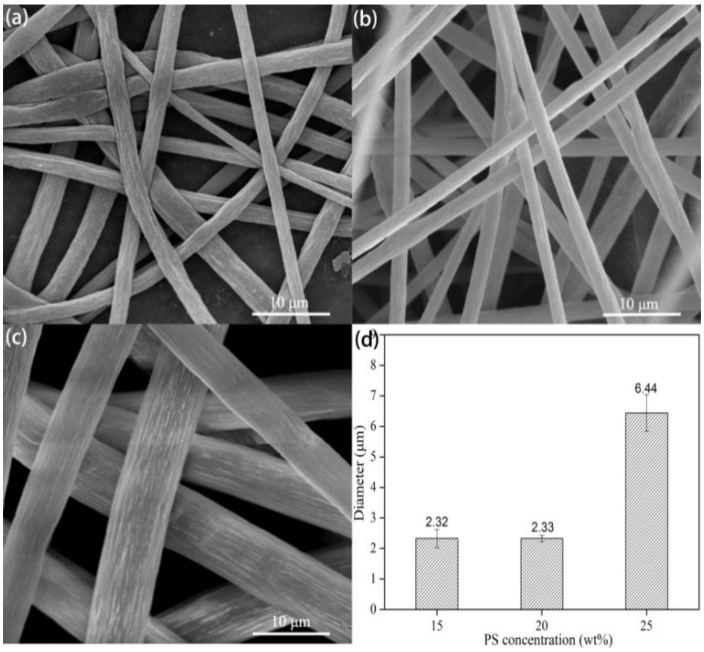


**Figure S2 SEM images of electrospun nanofibrous mats with different solution concentrations when the electrospinning voltage was 15kV, the ratio of DMF to THF was 1:3, and the addition of CNC was 7 wt%. (a) 15 wt% (b) 20 wt% (c) 25 wt% (d) Average diameter of nanofibers**

In Figure S2, for 15wt% solution concentration, ribbon-like nanofibers were formed. The average diameter of nanofibers produced from 15 wt% solution concentration (2.32 μm) was almost the same as those of 20 wt% (2.33 μm) which was uniform bead-free nanofibers. With further increasing solution concentration to 25 wt%, the nanofibers with large, homogeneous diameter but rough surface were obtained, and their average diameter was 6.44 μm.

## Electrospinning of spinning solution with different electrospinning parameters

### Different electrospinning voltages

The electrospinning PS/CNC solutions were prepared as above with 20% solution concentration, the 1:3ratio of DMF to THF, and 7 wt% CNC addition. The voltages for electrospinning as-prepared spinning solutions were set as 10 kV, 15kV and 20 kV.

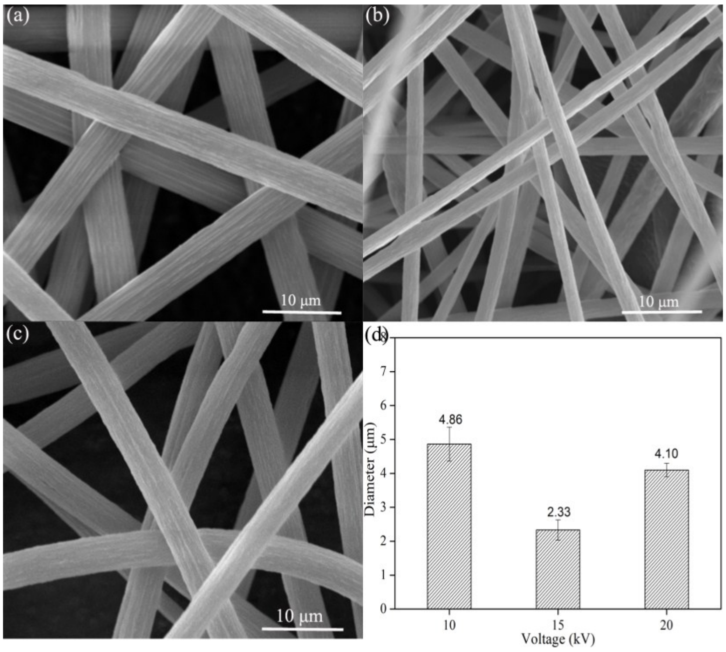


**Figure S3 SEM images of electrospun nanofibrous mats with different electrospinning voltage when the solution concentration was 20%, the ratio of DMF to THF was 1:3, and the addition of CNC was 7 wt%. (a) 10 kV (b) 15 kV (c) 20 kV (d) Average diameter of nanofibers**

The surface morphology of obtained nanofibers electrospun with different voltages had no obvious difference, however, the average diameter of such nanofibers was significantly affected by voltages. Nanofibers with homogeneous diameters can be seen in Figure S3(a) and (b) with average diameter of 4.86 μm and 2.33 μm, respectively. In Figure S3(c), when the electrospinning voltage was increased to 20 kV, the largest diameter of 4.1 μm was obtained. This was ascribed that although different voltages could result in different electric forces, the threshold of electric force to overcome the interfacial force of spinning solution was the identical for the same spinning solution, giving rise to similar electrospinning process with different electrospinning voltages.

**Different distances between needle and target**

The electrospinning PS/CNC solutions were prepared as above with 20% solution concentration, the 1:3ratio of DMF to THF, and 7 wt% CNC addition. The voltages for electrospinning as-prepared spinning solutions were set as 15kV. The electrospinning distances between needle and target were set as 10 cm, 15 cm and 20 cm.

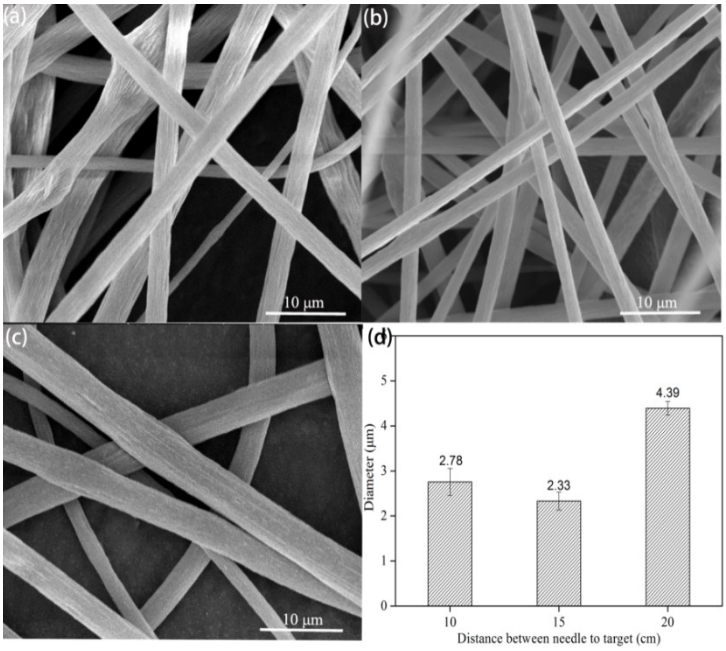


**Figure S4 SEM images of electrospun nanofibrous mats with different distances between needle and target when the electrospinning voltage was 15kV, the solution concentration was 20%, the ratio of DMF to THF was 1:3, and the addition of CNC was 7 wt%. (a) 10 cm (b) 15 cm (c) 20 cm (d) Average diameter of nanofibers**

In Figure S4, when the distance between needle and target was 10 cm, the morphology of obtained nanofibers was irregular with ribbon-like and strand-like structure, and their average diameter was 2.78 μm. As increasing the distances, the nanofibers were gradually changed to neat bead-free structure with average diameter 2.33μm and 4.39μm, respectively. Interestingly, when the distance was 20 cm, the diameter distribution of nanofibers was wider than those of 10 cm and 15 cm, which was attributed that the longer distance could result in reduced collection rate and prolonging collection time, leading to asynchronous collection of nanofibers.