Electronic Supplementary Material (ESI) for Soft Matter

Supporting Information

Drop Impacts on Electrospun Nanofiber Membranes

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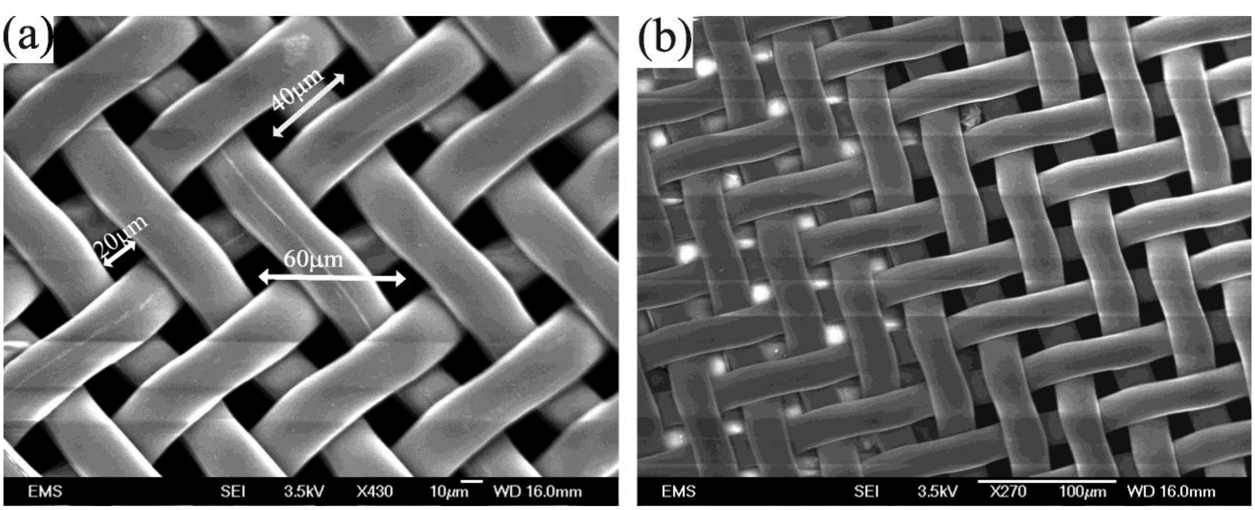

Fig. S1 SEM image of: (a) bare Nylon grid, (b) Teflon-coated Nylon grid. The image shows some blocked pores (the white areas), which were very infrequent. The blockage is due to a thin Teflon film. The majority of the pores are always open (the dark areas).

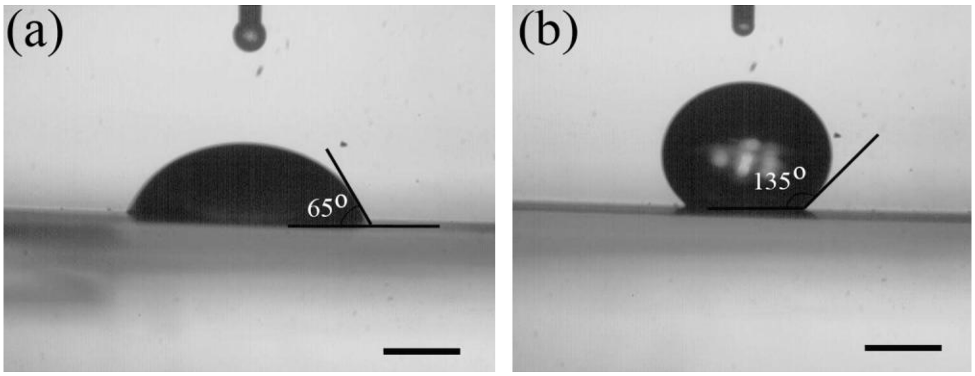

Fig. S2 Static contact angle of water drops on (a) a bare Nylon grid and (b) on a Teflon-coated Nylon grid. The images show that Teflon coating changed the partially wettable Nylon grids into rather hydrophobic ones under static conditions. Scale bars, 1mm.

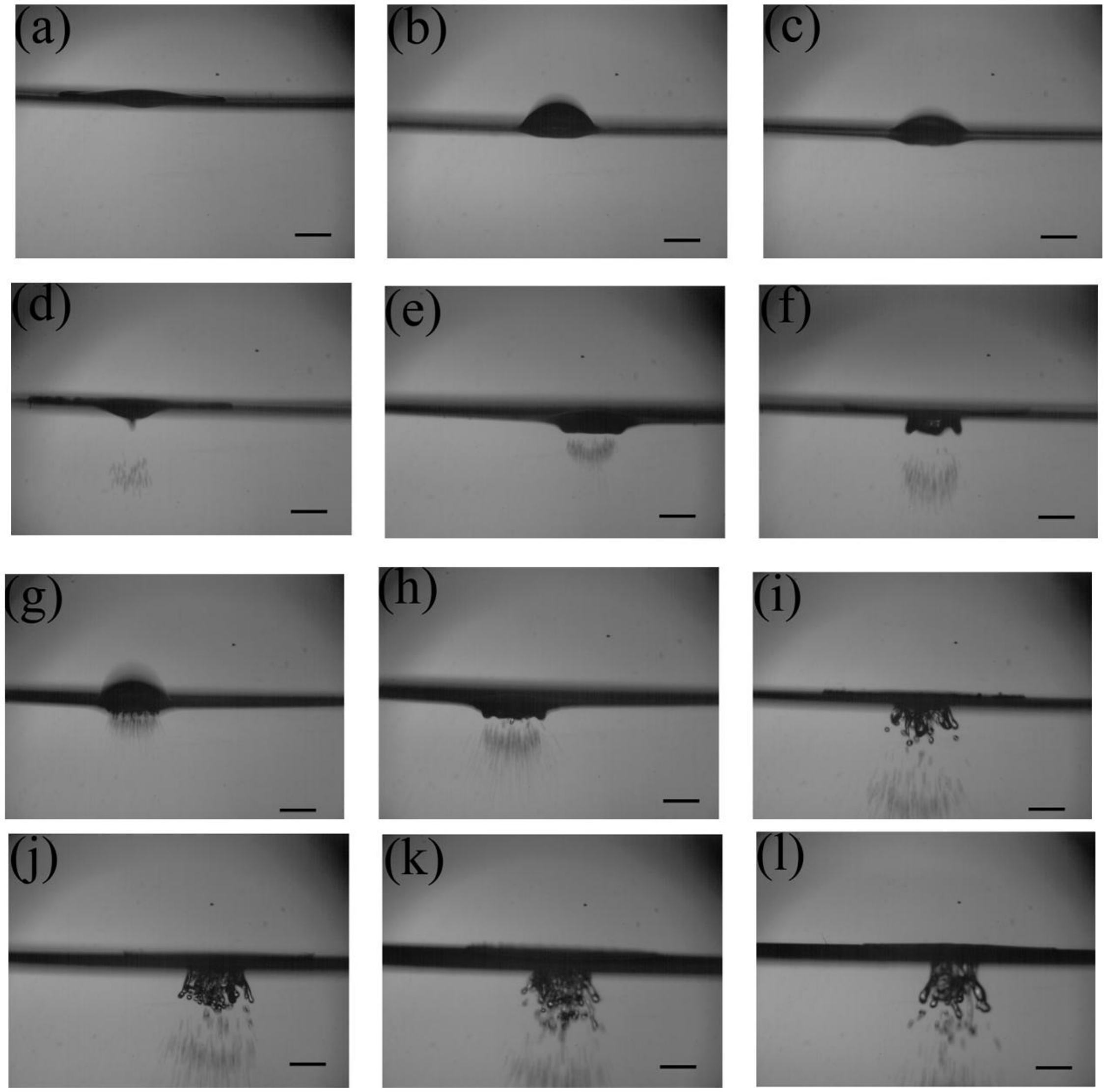

Fig. S3 Effect of the impact velocity on the penetration pattern of the FC 7500 drops onto Teflon-coated Nylon grid. (a) 1.0 m/s, (b) 1.41 m/s, (c) 1.73 m/s, (d) 2.0 m/s, (e) 2.23 m/s, (f) 2.44 m/s, (g) 2.64 m/s, (h) 2.82 m/s, (i) 3.0 m/s, (j) 3.16 m/s, (k) 3.31 m/s and (l) 3.46 m/s. All the images correspond to 2 ms after drop impact. Scale bars, 1mm.

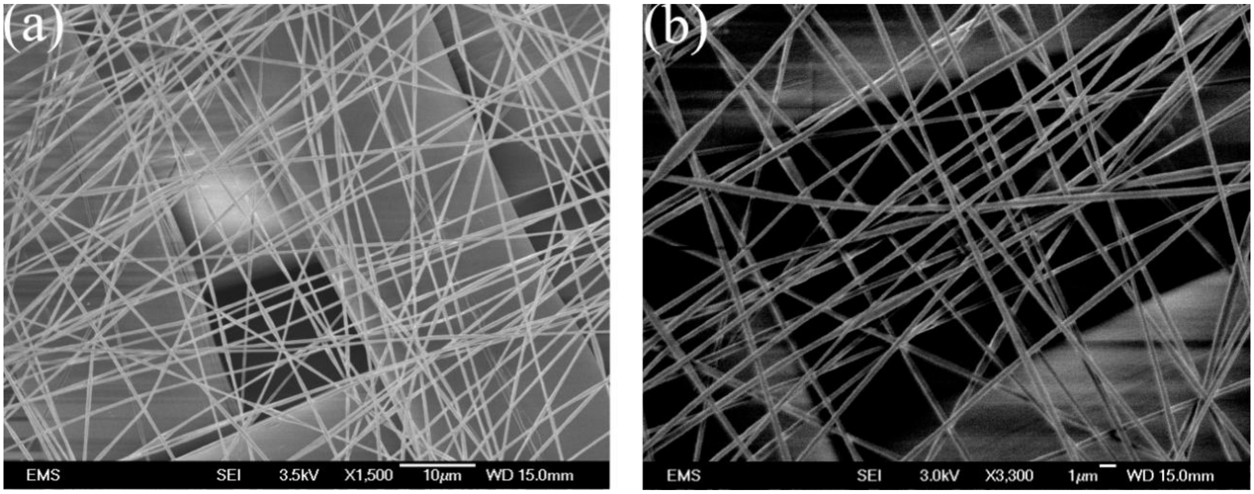

Fig. S4 SEM image of electrospun PAN nanofibers deposited onto bare Nylon grid for 60 s. (a) The overall view, (b) a zoomed-in view over an opening in the grid.

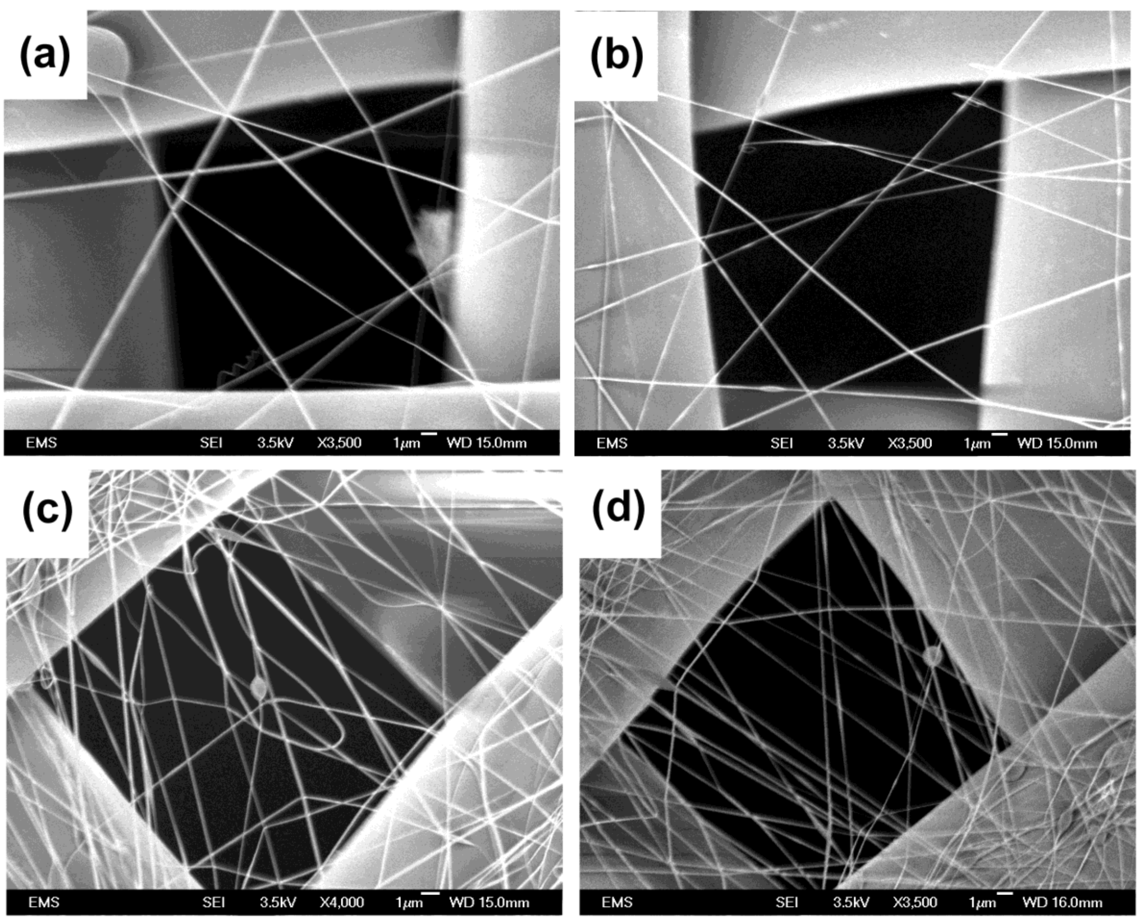

Fig. S5 Panels (a) and (b) show PAN nanofibers electrospun onto a Nylon grid for 20 s (two different locations). Panels (c) and (d) show PAN nanofibers electrospun onto Nylon grid for 60 s (two different locations). It can be seen from the images that a longer electrospinning time reduced the pore size significantly, while the mat thickness can stay approximately the same (see Fig. S6). This can be explained as follows. The Nylon grid, which is dielectric, is kept on a copper electrode during electrospinning. As polymer nanofibers are deposited onto the grid, they are attracted to the still open domains of the copper electrode. Moreover, the residual electric charge in the polymer nanofibers also tends to repel the oncoming polymer jet[1,2]. This repels the oncoming nanofiber loops toward the still open domains of the copper electrode, which diminishes pore size even more.

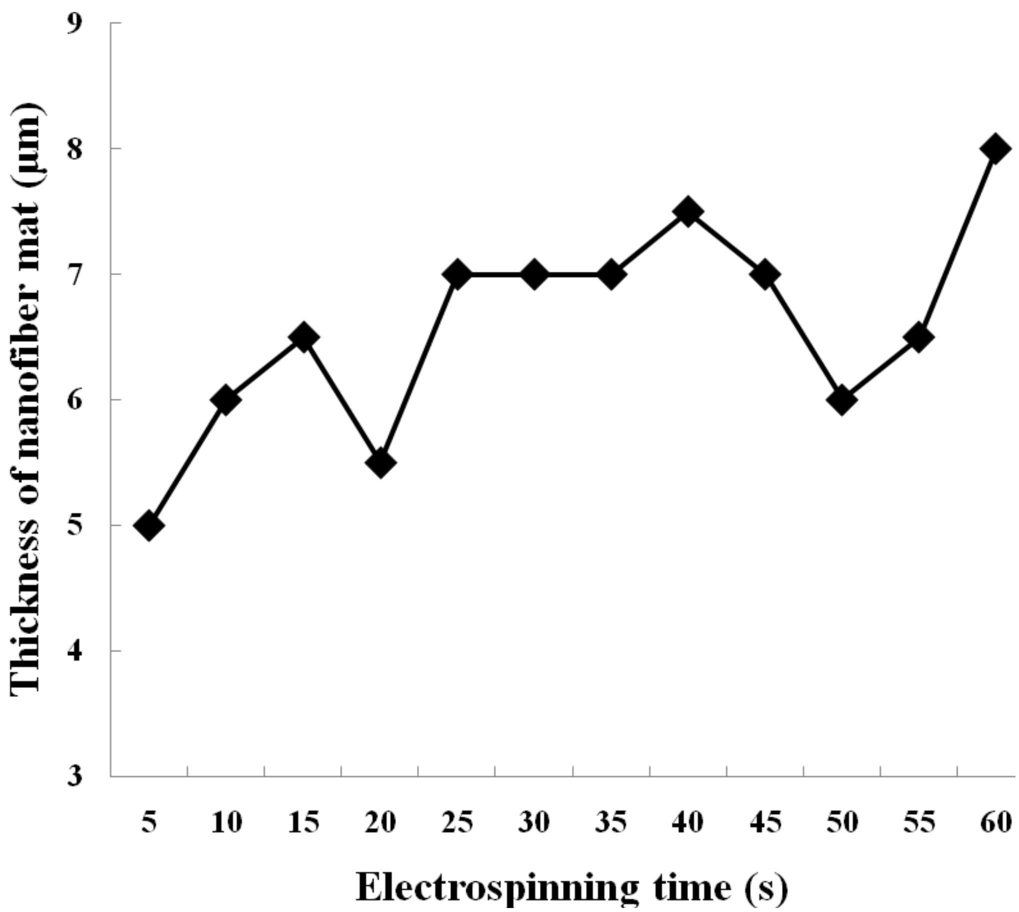

Fig. S6 Thickness of electrospun PAN nanofiber mat on bare Nylon grids versus the electrospinning time. There is no pronounced dependence of the mat thickness on the electrospinning time.

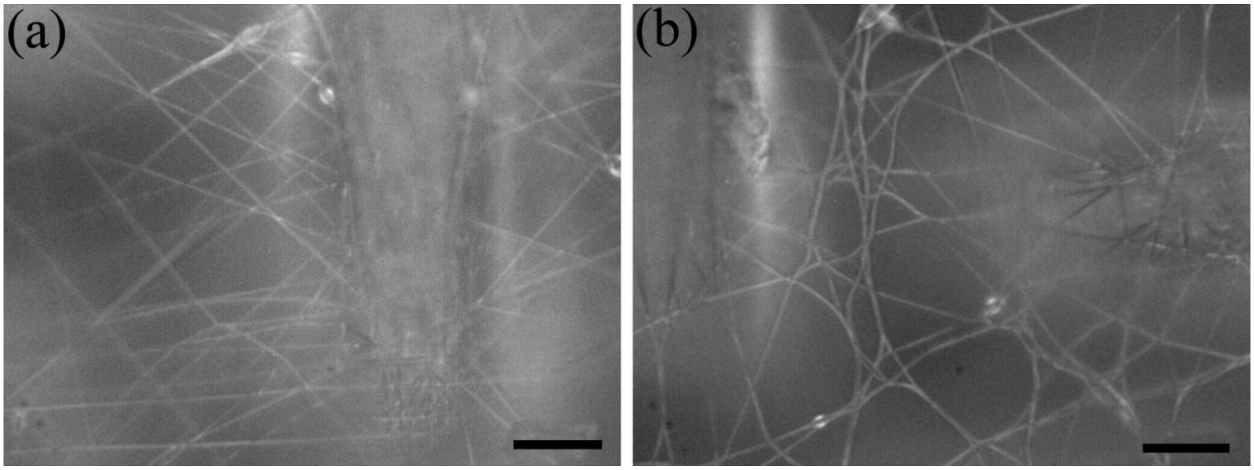

Fig. S7 Magnified optical images showing the same place of the nanofiber mat deposited over a Nylon grid before [in (a)] and after [in (b)] water drop impact. The deposition time of the nanofiber mat was 60 s and the drop impact velocity was 3.46 m/s. Scale bars, 10 μm.

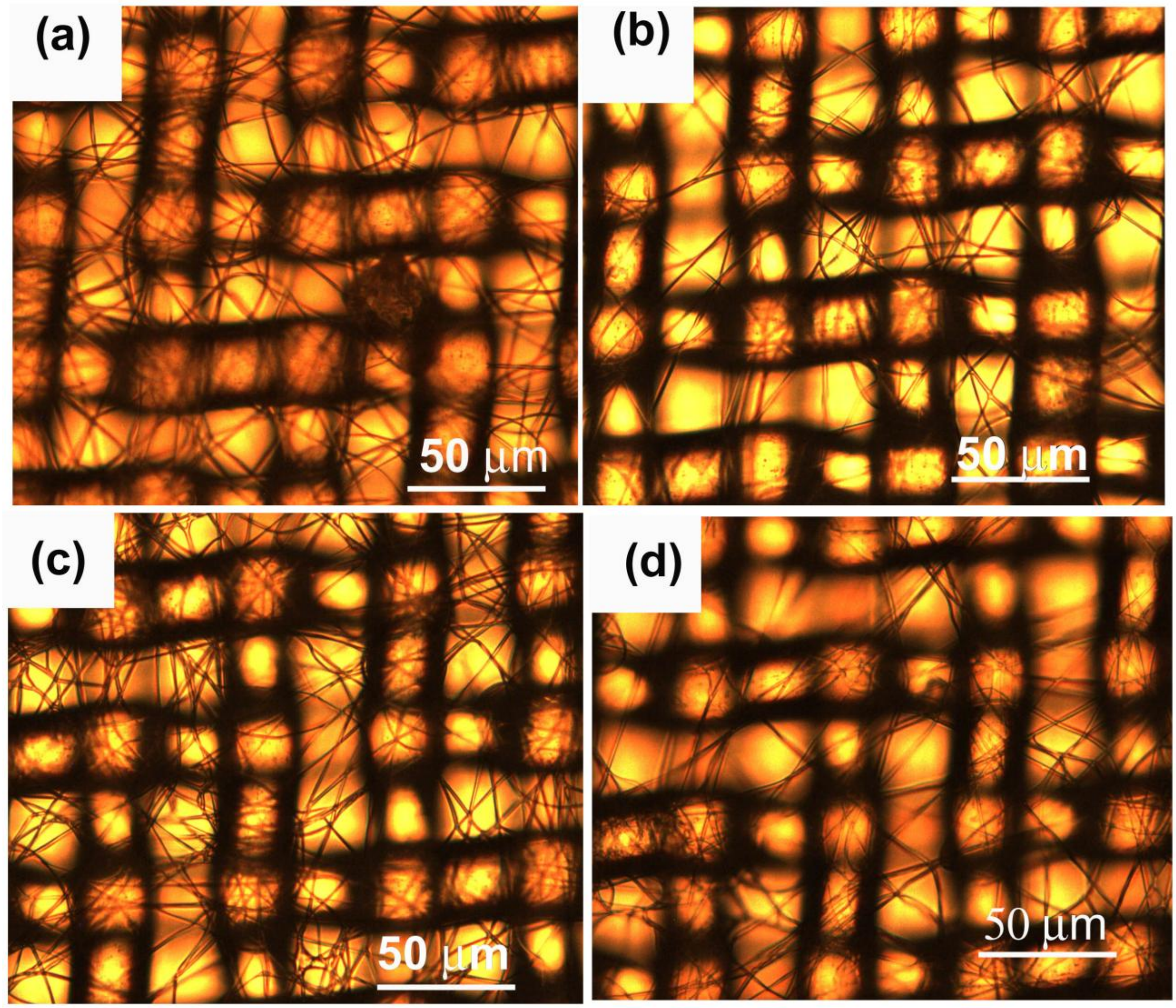

Fig S8. Optical images of electrospun PAN nanofiber mat on a Nylon grid. (a) Before drop impact, (b) after 4 impacts, (c) after 6 impacts, and (d) after 8 impacts of 1 mm drop of FC 7300. This liquid has a relatively low surface tension, which diminishes nanofiber rearrangement when samples are dried after drop impact prior to the observations. In addition, see also Fig. 19.

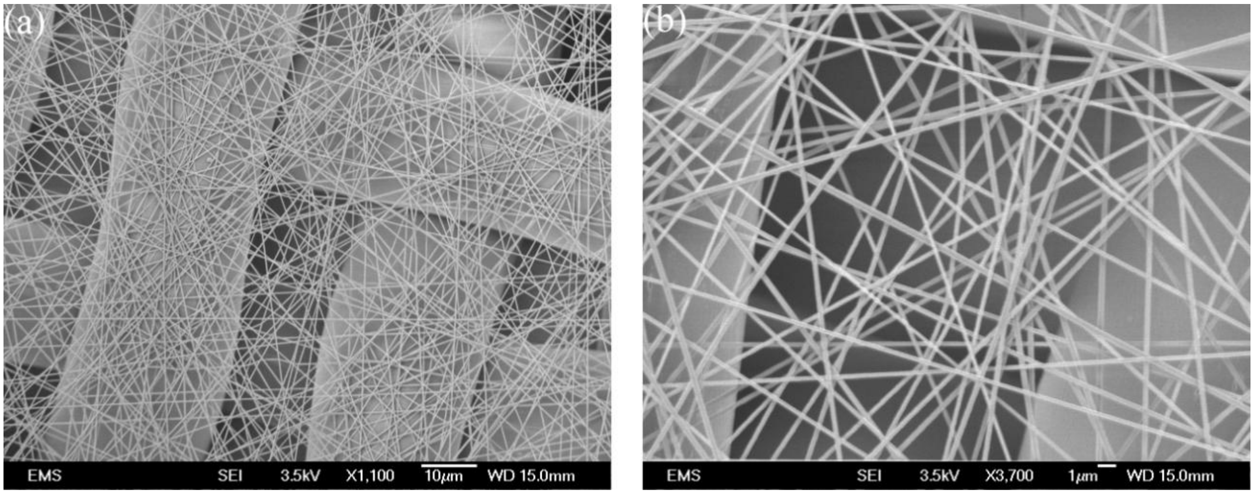

Fig. S9 SEM images of Nylon 6/6 nanofibers collected over a bare Nylon grid. (a) The overall view, and (b) a zoomed-in image.

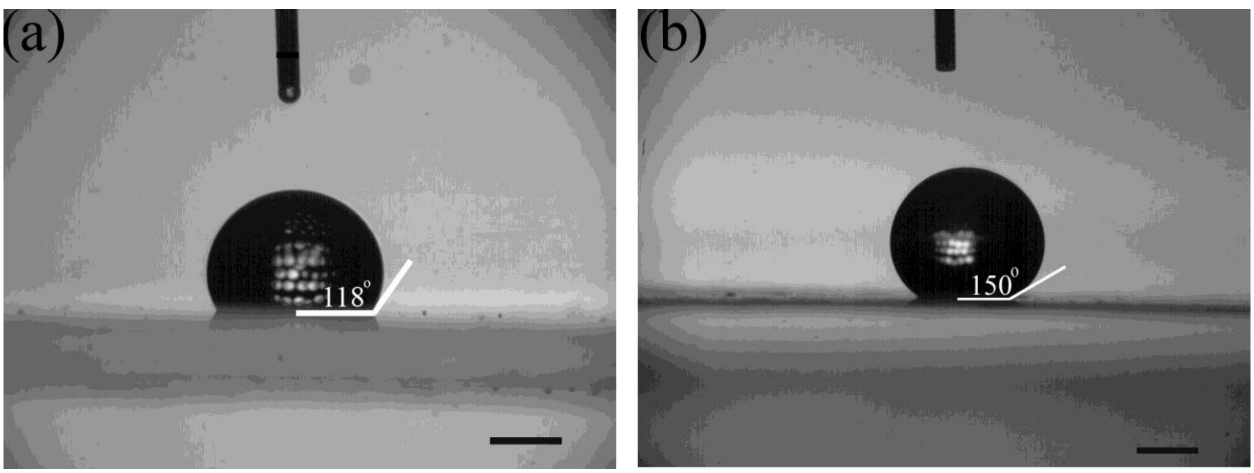

Fig. S10 Static contact angle of water drop on (a) cast Teflon on the glass slide and (b) on electropsun Teflon nanofiber mat collected on a Nylon grid. Scale bars, 1mm.

References

1. E. Zussman, A. Theron and A.L. Yarin, *Appl. Physics Letters*, 2003, **82**, 973-975.

2. T. Han, A.L. Yarin and D.H. Reneker, *Polymer*, 2008, **49**, 2160-2169.