Supporting Information

Bio-inspired, Colorful, Flexible, Defrostable Light-scattering Hybrid Films for Effective Distribution of LED Light

Seongpil An,‡[a] Hong Seok Jo,‡[a] Yong Il Kim,[a] Kyo Yong Song,[a]

Min-Woo Kim,[a] Kyu Bum Lee,[b] Alexander L. Yarin,*[a,c] Sam S. Yoon*[a]

[a] School of Mechanical Engineering, Korea University, Seoul 02841, Republic of Korea

[b] NGL Co. Ltd., Gyeonggi-do 15843, Republic of Korea

[c] Department of Mechanical and Industrial Engineering, University of Illinois at Chicago, 842 W. Taylor St., Chicago IL 60607-7022, U.S.A.

*Corresponding author: ayarin@uic.edu, skyoon@korea.ac.kr

‡These authors contributed equally to this work.

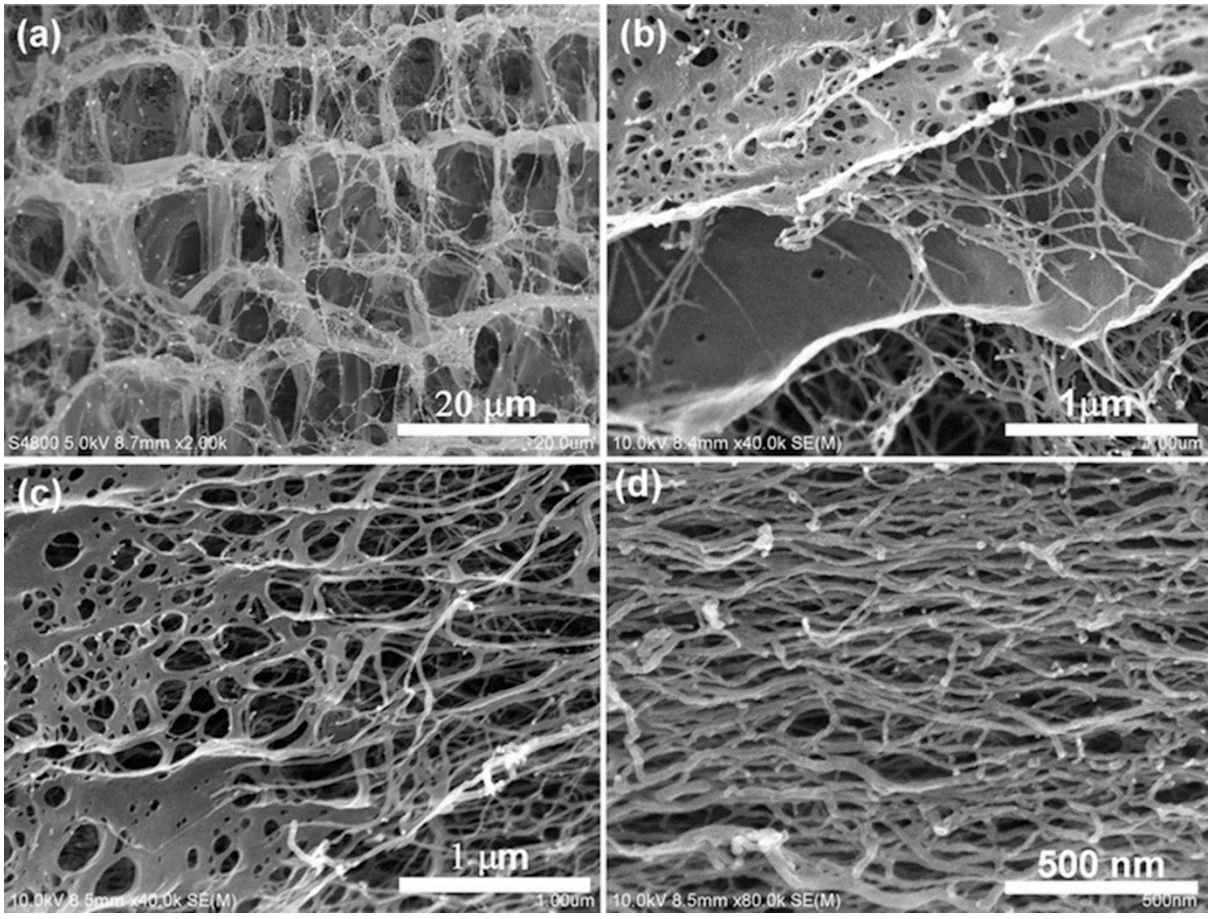

Fig. S1 SEM micrographs of the freeze-dried jellyfish mesoglea. Reproduced from reference 1 with the permission of The Royal Society of Chemistry.

Fig. S2 Photographs of the fabricated films illustrating each step of the fabrication process: (a) light-scattering layers on glass before applying PDMS (cf. **Fig. 2**b), (b) light-scattering layers (on glass) after applying PDMS and the middle glass (cf. **Fig. 2**d), and (c) the hybrid films (where the defrosting layers and the top glasses were applied, cf. **Fig. 2**f). The first electrospinning time t_1 was 5 min, 15 min, 30 min, 60 min, and 120 min from the left to the right columns.

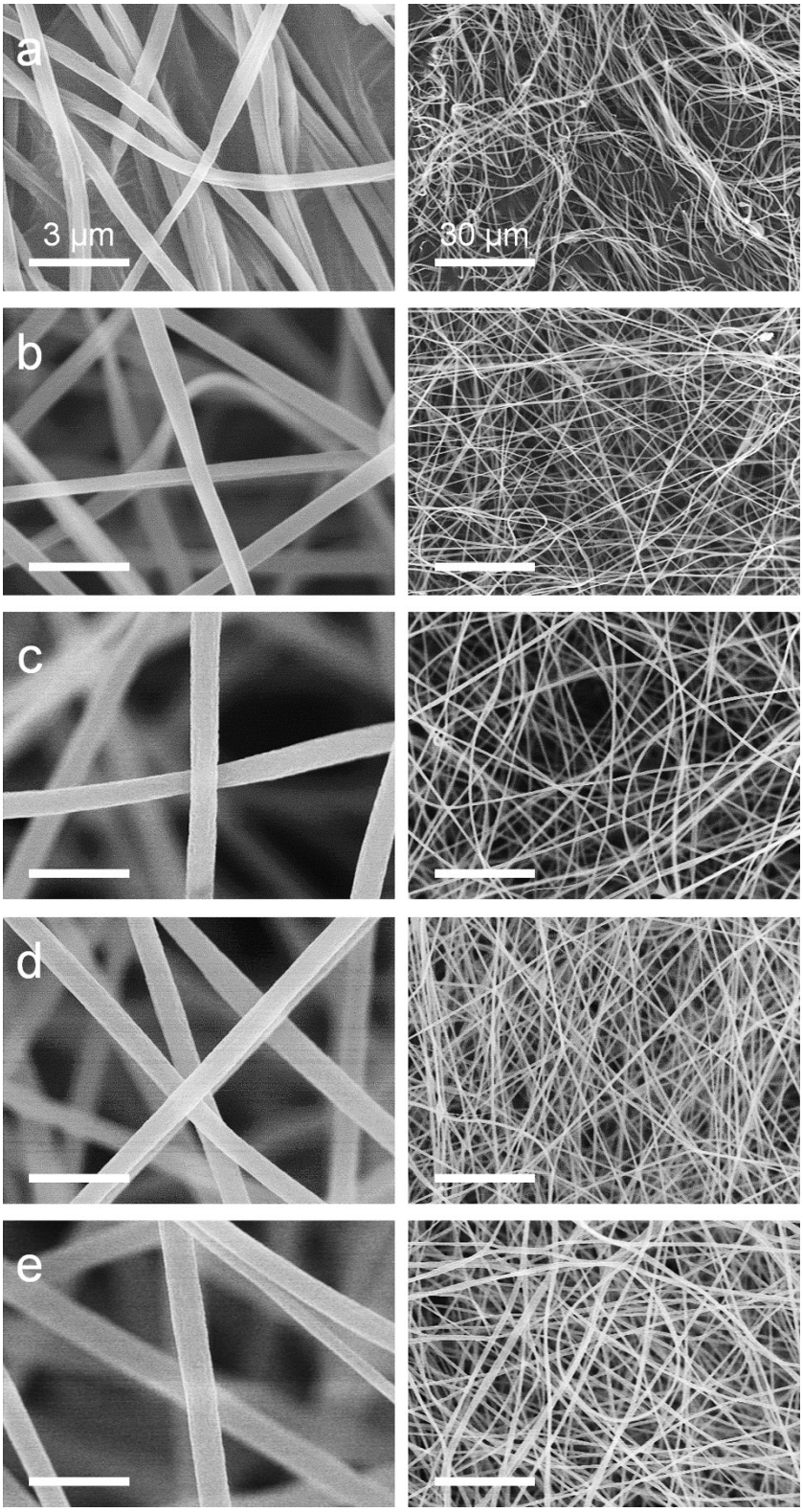

Fig. S3 SEM images of PAN NFs on glass before applying PDMS as a function of the first electrospinning time t_1: (a) t_1 = 5 min, (b) t_1 = 15 min, (c) t_1 = 30 min, (d) t_1 = 60 min, and (e) 120 min. The inset scale bars in each column are same.

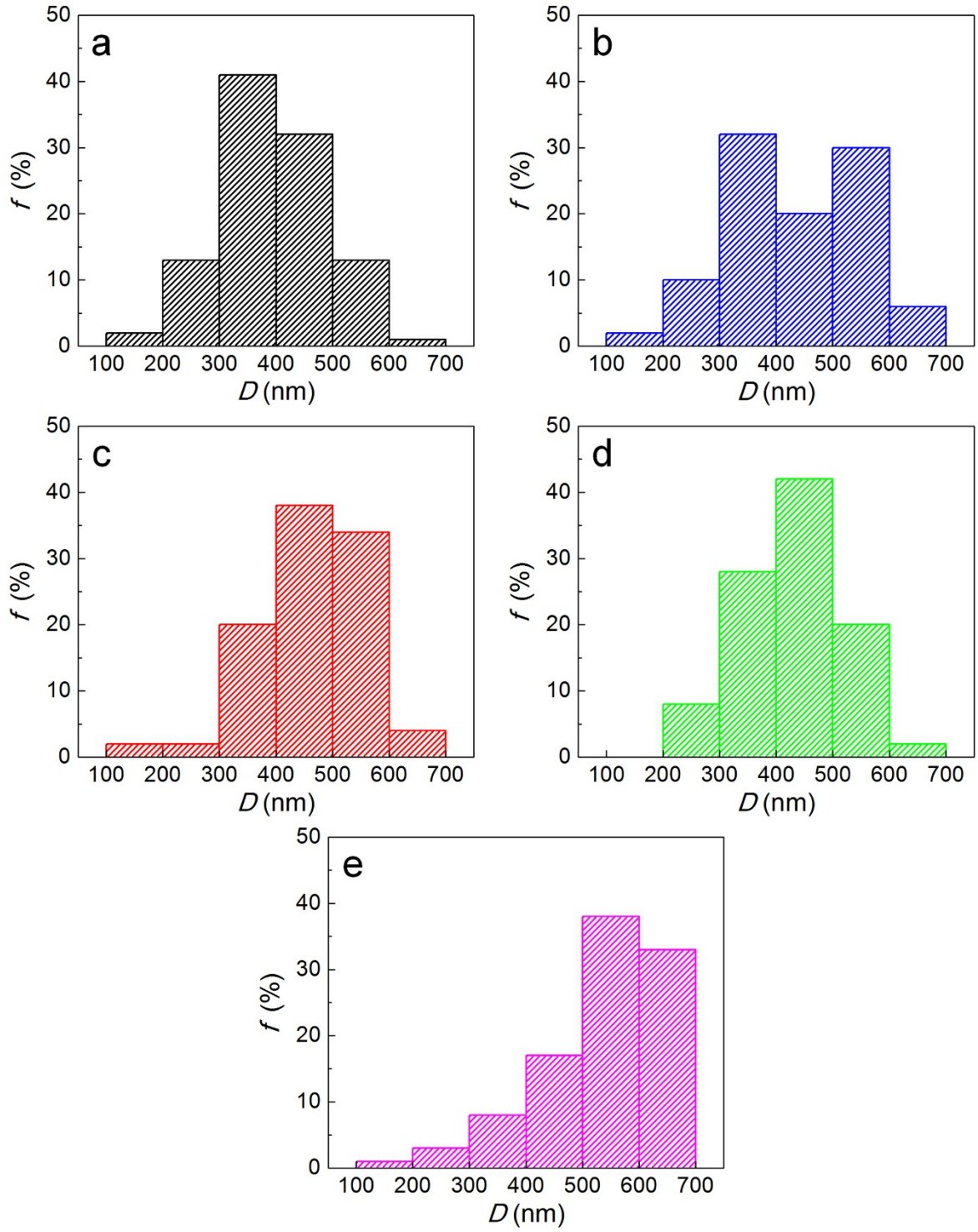

Fig. S4 Fiber-size distributions of PAN NFs on glass before applying PDMS as a function of the first electrospinning time t_1: (a) t_1 = 5 min, (b) t_1 = 15 min, and (c) t_1 = 30 min, (d) t_1 = 60 min, and (e) t_1 = 120 min (f: frequency and D: cross-sectional fiber diameter).

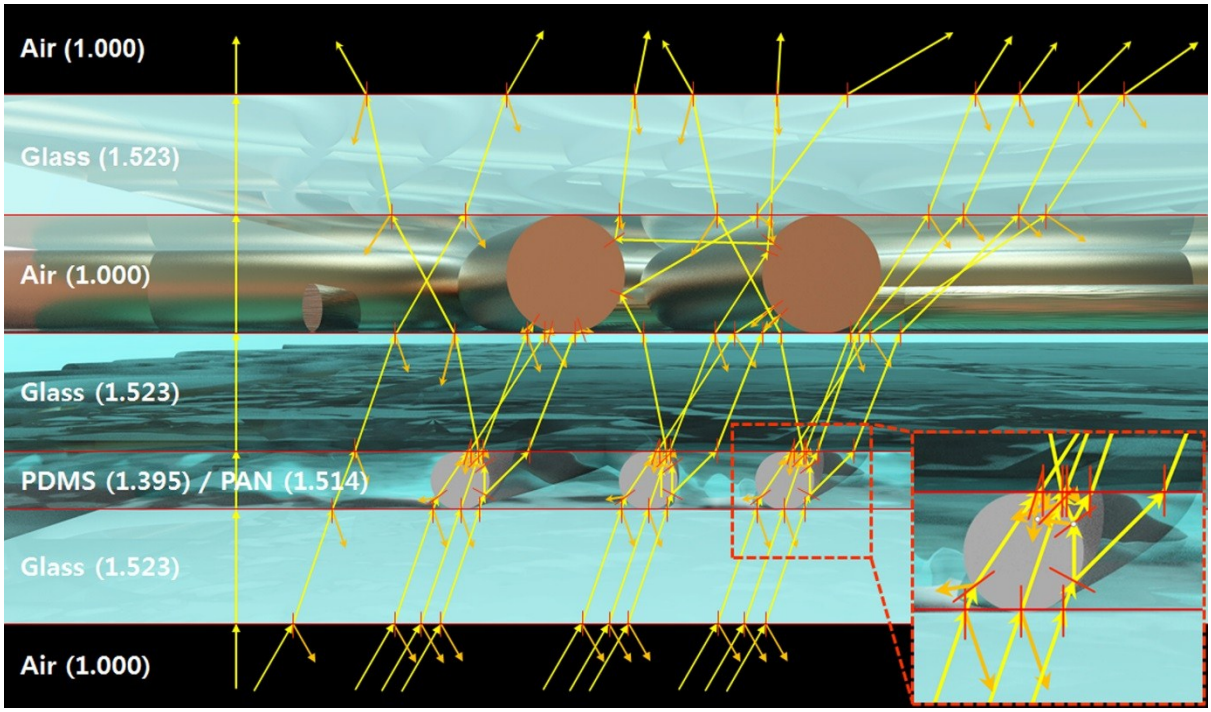

Fig. S5 Schematic illustration of light paths through the hybrid film.

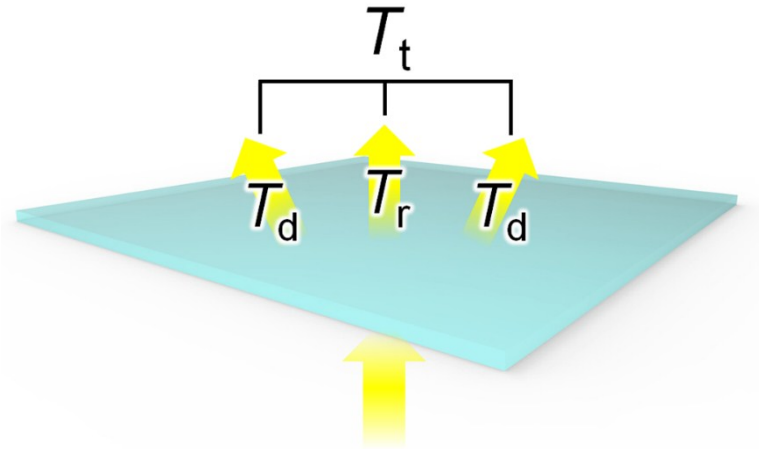

Fig. S6 Schematic illustration of total transmittance (T_t), parallel transmittance (T_r), and diffuse transmittance (T_d).

Fig. S7 Photographs of the (a and d) yellow-, (b and e) blue-, and (c and f) red-colored light-scattering layers on glass for t_1 = 120 min (a, b, and c) before applying PDMS, and (d, e, and f) after applying PDMS and the middle glass.

References

1 X. Wang, H. Wang and H. R. Brown, *Soft Matter*, 2011, **7**, 211-219.