## Anisotropic oxygen plasma etching of colloidal particles in electrospun fibers

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## **Supporting information**

*Preparation of PS spheres*. Monodisperse PS spheres with diameter of 1.4  $\mu$ m were synthesized as described in literature.<sup>1</sup>

Preparation of solution for spherical silica with PS patches at the two ends. Monodisperse SiO<sub>2</sub>@PS core-shell particles were synthesized as described in literature.<sup>2</sup> The PVP solution containing SiO<sub>2</sub>@PS particle was prepared as follows: Typically, 10 mg trimethyl ammonia chloride (TMACl) was dissolved in 3 ml H<sub>2</sub>O and 16 ml ethanol mixed solution. 50 mg PVP ( $M_w$ =1300000) was dissolved in 1 ml mixed solution mentioned above. 10 mg SiO<sub>2</sub>@PS particle was dispersed in the solution followed by electrospinning in the same condition as electrospinning PVP fibers containing PS colloids except a voltage of 20 kV was applied.

*Characterizations*. The SEM characterization was mainly carried on JEOL S4300 and S4800 with accelerating voltage of 15 kV. The TEM images were shot with JEM1011 with accelerating voltage of 100 kV.

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Fig. S1. SEM image of etched structure at the stage where PVP fibers snaps.



Fig. S2. SEM image of an irregularly etched PS particle due to the contact of colloidal particle with the substrate.



Fig. S3. The SEM image of PS particles (a) in multilayer fibers before and (b) released after 5 min plasma etching. The polydispersity of the (c) long and (d) short axis statistically measured from (b).

Theoretically, the patches should sit symmetrically at the two ends of silica spheres, however, some discrepancy can be found in Fig. S4. The main reason of the asymmetric patches around some particles (highlighted by white circles in Fig. S4) is because the axis of the fiber is not totally aligned to the center of the SiO<sub>2</sub>@PS particles. And the discrepancy is about 20% of the overall particles.



Fig. S4. The SEM image of silica spheres with double-sided patches. The asymmetric patched spheres are highlighted by white circles.

## References

1. Q. Liu, L. Wang, A. Xiao, H. Yu, Q. Tan, J. Ding, C. Yu, Macromol. Symp., 2008,

## 261, 113.

2. J. Ge, Y. Hu, T. Zhang, Y. Yin, J. Am. Chem. Soc., 2007, 129, 8974.