Supplementary information

SERS-active substrates assembled by Ag NWs-embedded porous polystyrene fibers

Shulin Chen, a, b # Chen Ding, b # Yong Lin, b Xinzhou Wu, b Wei Yuan, b * Xiuqing Meng, a * Wenming Su, b and Ke-Qin Zhang, c *

a. Zhejiang Provincial Key Laboratory of Solid State Optoelectronic Devices, Zhejiang Normal University, Jinhua 321004, China. E-mail: xqmeng@zjnu.cn

b. Printable Electronics Research Centre, Suzhou Institute of Nanotech and Nanobionics, Chinese Academy of Sciences, Suzhou 215123, China. E-mail: wyuan2014@sinano.ac.cn

c. National Engineering Laboratory for Modern Silk, College of Textile and Clothing Engineering, Soochow University, Suzhou 215123, China. E-mail: kqzhang@suda.edu.cn
Table S1. Summary of the flexible SERS substrates based on metallic nanomaterials and electrospun polymer fibers

| Electrospun polymer | metallic nanomaterial | Composite mode | Probing molecule | Limit of detection | Reference |
|---------------------|-----------------------|----------------|------------------|-------------------|-----------|
| PVA                 | Ag NPs               | Embedded       | 4-mercaptobenzoic acid (4-MBA) | $10^{-9}$ M | 1. ACS Nano, 2009, 3, 3993. |
| PVA                 | Au NPs               | Embedded       | 4-MBA            | $10^{-7}$ M      | 2. J Polym. Res., 2012, 19, 9810. |
| PVA                 | Gold Nanorods        | Embedded       | 3,3’-diethythiatriacarbocyanine iodide (DTTCI) | $10^{-7}$ M | 3. Small, 2012, 8, 648. |
| PVP                 | Ag Nanowires         | Embedded       | 4,4’-bipyridine  | $10^{-7}$ M      | 4. Small, 2012, 8, 2936. |
| PVA                 | Au nanorods with Ag nanowires | Embedded | DTTCI | $10^{-7}$ M | 5. Nanoscale, 2012, 4, 5348. |
| PAN                 | Ag NPs               | immobilized onto fibers | Rhodamine 6G (R6G) | 10 ppb | 6. Langmair, 2012, 28, 14433. |
| PAN                 | Ag nanocrystals      | immobilized onto fibers | 4-MBA & 4-ATP | $10^{-10}$ M & $10^{-10}$ M | 7. Analyst, 2015, 140, 5190 |
| PLLA               | CTAB-coated gold nanorods | immobilized onto fibers | R6G and malachite green | 0.1 nM | 8. ACS Appl. Mater. Interfaces, 2015, 7, 5391. |
| PS                 | Ag NPs               | immobilized onto fibers | R6G & carbofuran | $10^{-7}$ M | 9. Anal. Methods, 2017, 9, 3998–4003 |
| PAA/PVA composite fiber | Gold nanoparticle | immobilized onto fibers | 4-ATP & R6G | $10^{-9}$ M & $10^{-9}$ M | 10. Appl. Surf. Sci., 2017, 403, 29. |
| PCL                | Ag NPs               | Embedded       | R6G, crystal violet, 4-Mph and melamine | $10^{-10}$ M, $10^{-11}$ M, $10^{-8}$ M, 5 ppb | 11. RSC Adv., 2017, 7, 47373. |
| PLLA&PAN           | Ag NPs               | immobilized onto fibers | 4-ATP, R6G | $10^{-9}$ M, $10^{-9}$ M | 12. New J. Chem., 42, 2018, 11185. |
| PAA/PVA            | Au NPs & Pd NCs      | Embedded       | 4-ATP            | $10^{-13}$ M     | 13. RSC Adv., 2018, 8, 9344. |
| PCL                | Au NPs               | immobilized onto fibers | prostate specific antigen (PSA) | 1 pg/mL. | 14. J Ind. Eng. Chem., 2020, 82, 341. |
Figure S1. Photograph of the synthesized Ag NWs in flask.

Figure S2. The thickness of electrospun fiber mats as function of electrospinning time
Figure S3. The diameter distribution of electrospun Ag NWs/PS composite fibers.

Figure S4. The UV-Vis adsorption spectra of Ag NWs/ethanol solution and Ag NWs/PS composite fiber mat.
Figure S5. The number of Ag NWs in electrospun fiber as fraction of Ag NWs content in electrospun solutions.

Figure S6. The water contact angle of Ag NWs/PS casting films (a) and electrospun fiber mats (b)
Figure S7. SEM images of obtained Ag NWs/PS composite solid fiber

Figure S8. Surface and cross-section SEM images of Ag NWs/PS porous (a) and solid (b) composite films; The fluorescence microscope images of Ag NWs/PS porous (c) and solid (d) composite films after dropping FITC/ethanol solution.
Figure S9. The SEM images of Ag NWs/PS porous film (a) and solid film (b), the content of Ag NWs is 50 mg.

Reference:

1. D. He, B. Hu, Q.-F. Yao, K. Wang, S.-H. Yu, ACS Nano, 2009, 3, 3993.
2. M. Cao, S. Cheng, X. Zhou, Z. Tao, J. Yao, L.-J. Fan, J Polym. Res., 2012, 19, 9810.
3. C.-L. Zhang, K.-P. Lv, H.-P. Cong, S.-H. Yu, small, 2012, 8, 648.
4. C.-L. Zhang, K.-P. Lv, N.-Y. Hu, Le Yu, X.-F. Ren, S.-L. Liu, S.-H. Yu, small, 2012, 8, 2936.
5. C.-L. Zhang, K.-P. Lv, H.-T. Huang, H.-P. Cong, S.-H. Yu, Nanoscale, 2012, 4, 5348.
6. L. Zhang, X. Gong, Y. Bao, Y. Zhao, M. Xi, C. Jiang, H. Fong, Langmuir, 2012, 28, 14433.
7. P. Jia, J. Qu, B. Cao, Y. Liu, C. Luo, J. An, K. Pan, Analyst, 2015, 140, 5190.
8. J. Shao, L. Tong, S. Tang, Z. Guo, H. Zhang, P. Li, H. Wang, C. Du, X.-F. Yu, ACS Appl. Mater. Interfaces, 2015, 7, 5391.
9. K. Jalaja, S. Bhuvaneswari, Ganiga M., R. Divyamol, S. Anup, J. Cyriac, B. K. George, Anal. Methods, 2017, 9, 3998.
10. Z. Liu, Z. Yan, L. Jia, P. Song, L. Mei, L. Bai, Y. Liu, Appl. Surf. Sci., 2017, 403, 29.
11. J. Shi, T. You, Y. Gao, X. Liang, C. Li, P. Yin, RSC Adv., 2017, 7, 47373.25
12. Z. Liu, Z. Yana, L. Bai, New J. Chem., 2018, 42, 11185.
13. Z. Liu, Z. Yana, L. Bai, RSC Adv., 2018, 8, 9344.
14. B. J. Yun, W.-G. Koh, J Ind. Eng. Chem., 2020, 82, 341.