Supporting Information

Pollutant capturing SERS substrate: Porous boron nitride microfibers with uniform silver nanoparticles decoration

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Content

1.

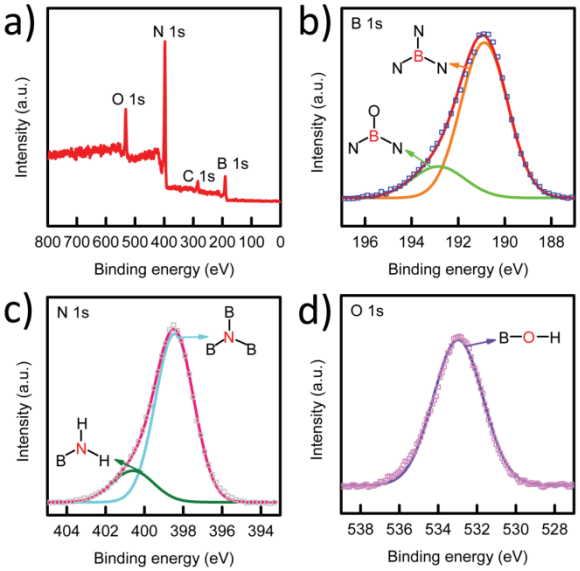

Fig. S1 XPS spectra of BN microfibers. (a) Survey spectrum indicates the presence of B, N, C and O. (b) B 1s spectrum. The main sp^2-hybridized BN structure shows a peak at 190.8 eV, while a shoulder peak located at 192.7 eV is attributed to the edge or interfacial BN structures linked with –OH. (c) N 1s spectrum. Besides the main sp^2-hybridized BN structures, the shoulder peak located at 400.5 eV belongs to the surface –NH– or $–NH_2$ groups (d) O 1s spectrum. O 1s peak at 533.0 eV can be fitted to hydroxyl.

2.

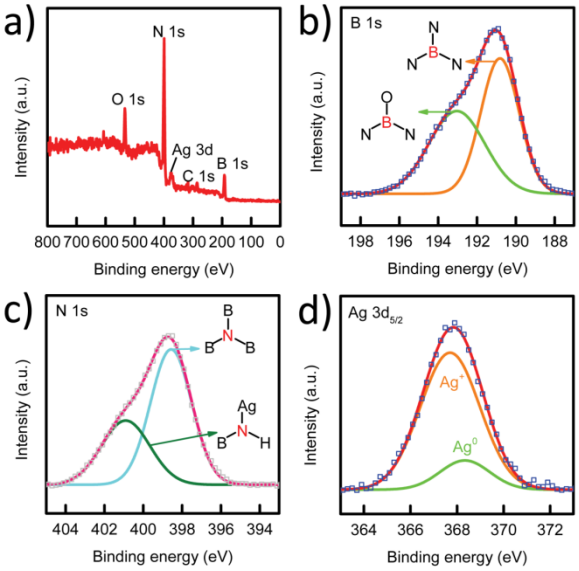

Fig. S2 XPS spectra of BN microfibers with Ag^+ absorbed on their surface. (a) Survey spectrum indicates the presence of B, N, C, O and Ag. (b) B 1s spectrum. The main sp^2-hybridized BN structure shows a peak at 190.8 eV, while a shoulder peak located at 192.7 eV is attributed to the edge or interfacial BN structures linked with –OH. (c) N 1s spectrum. Besides the main sp^2-hybridized BN structures, the shoulder peak located at 401.0 eV belongs to the surface –NH– or $–NH_2$ groups linked with Ag^+. (d) Ag $3d_{5/2}$ spectrum. Peaks at 367.7 eV and 368.4 eV are attributed to Ag^+ and Ag^0, respectively. Judging from the peak area, the main chemical state of silver is Ag^+.

3.

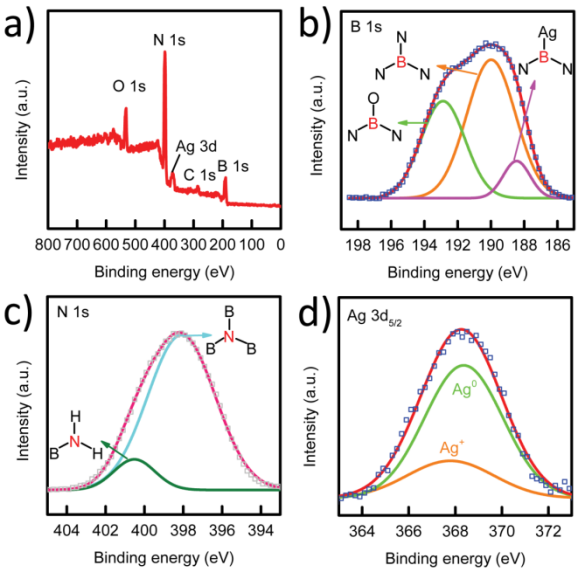

Fig. S3 XPS spectra of BN microfibers with Ag nanoparticles on their surface. (a) Survey spectrum indicates the presence of B, N, C, O and Ag. (b) B 1s spectrum. The main sp^2-hybridized BN structure shows a peak at 190.8 eV, while a shoulder peak located at 192.7 eV is attributed to the edge or interfacial BN structures linked with –OH. A third peak fitted at 188.4 eV usually presents in boride, which we attributed to the contact of B and Ag. (c) N 1s spectrum. Besides the main sp^2-hybridized BN structures, the shoulder peak located at 401 eV belongs to the surface –NH– or $–NH_2$ groups. (d) Ag $3d_{5/2}$ spectrum. Peaks at 367.7 eV and 368.4 eV are attributed to Ag^+ and Ag^0, respectively. Most of the Ag^+ has transformed into metallic silver, as judged from the peak areas of Ag^+ and Ag^0.

4.

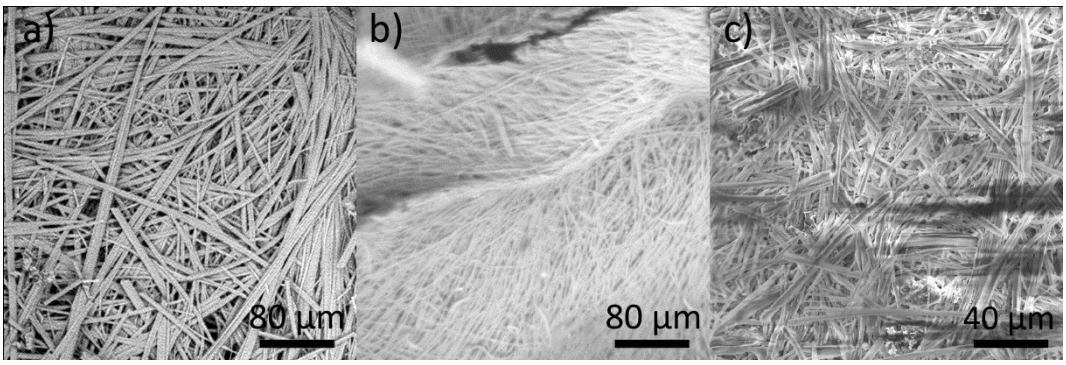

Fig. S4 Low-magnification SEM images of a) M2B precursor b) BN microfibers and c) BN/Ag hybrids.

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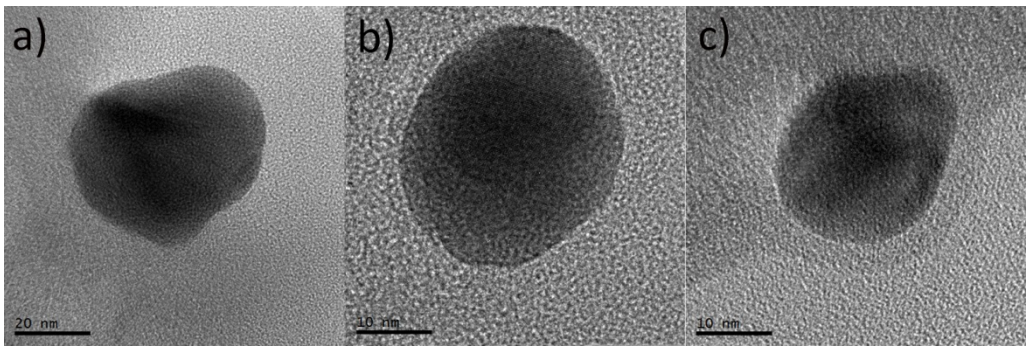

Fig. S5 TEM images of Ag nanoparticles with different sizes and shapes on a BN microfiber.

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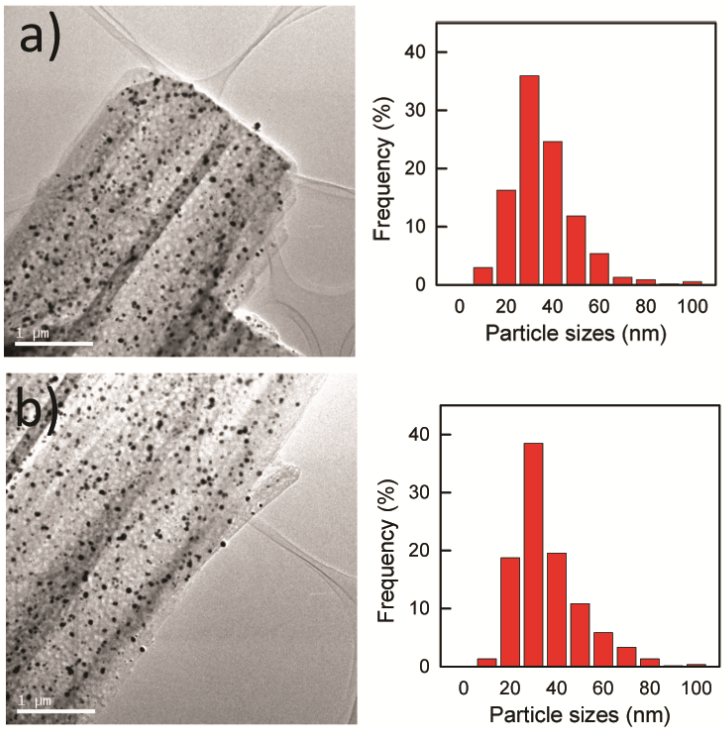

Fig. S6 TEM images of the other two parts of Ag nanoparticle-decorated BN microfibers and the size distribution of Ag nanoparticles.

7.

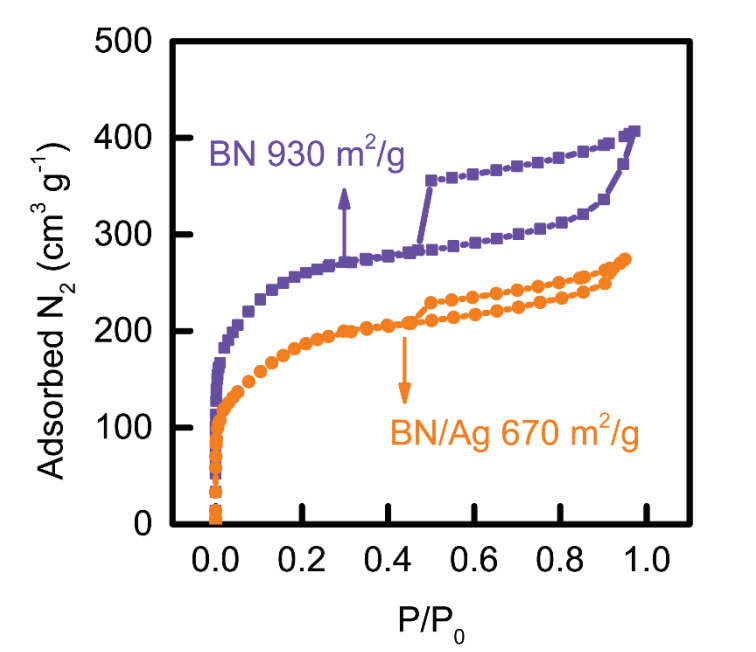

Fig. S7 Nitrogen adsorption-desorption isotherms of BN microfibers and Ag-decorated BN microfibers. Bare BN microfibers hold a high specific surface area of 930 m^2/g. The loaded Ag nanoparticles occupied some holes within BN microfibers and, therefore, the resultant specific surface area decreased to 670 m^2/g.

8.

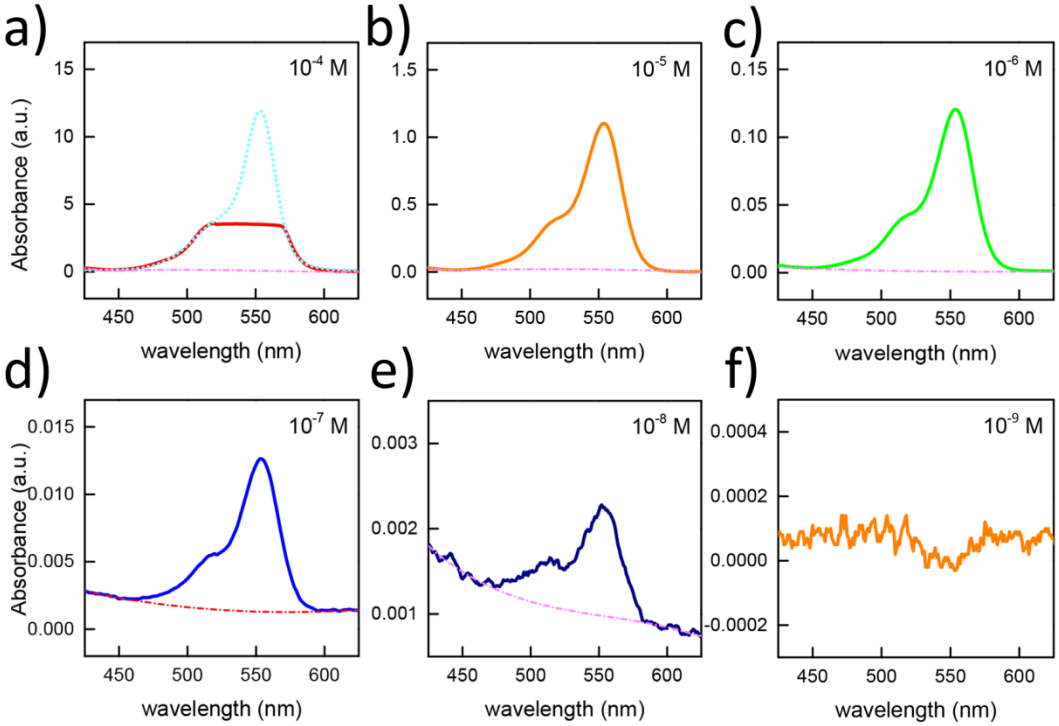

Fig. S8 UV-vis spectra of RhB solutions whose concentrations are 10^{-4} M, 10^{-5} M, 10^{-6} M, 10^{-7} M, 10^{-8} M and 10^{-9} M. 10^{-4} M RhB solution is so concentrated that it generates a flat peak tip. Therefore, we fit the curve to get the peak. RhB solutions of 10^{-5} M, 10^{-6} M, 10^{-7} M and 10^{-8} M show a characteristic peak at 552 nm. 10^{-9} M RhB solution concentration is too low to be detected by UV-vis spectra. The dot-dash lines are baselines which are subtracted.

9.

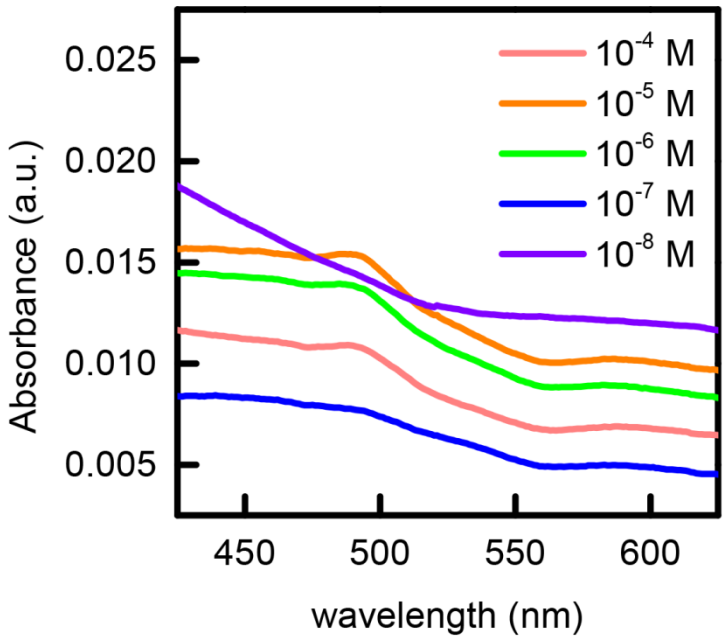

Fig. S9 UV-vis spectra of RhB solutions after BN/Ag adsorption.

10.

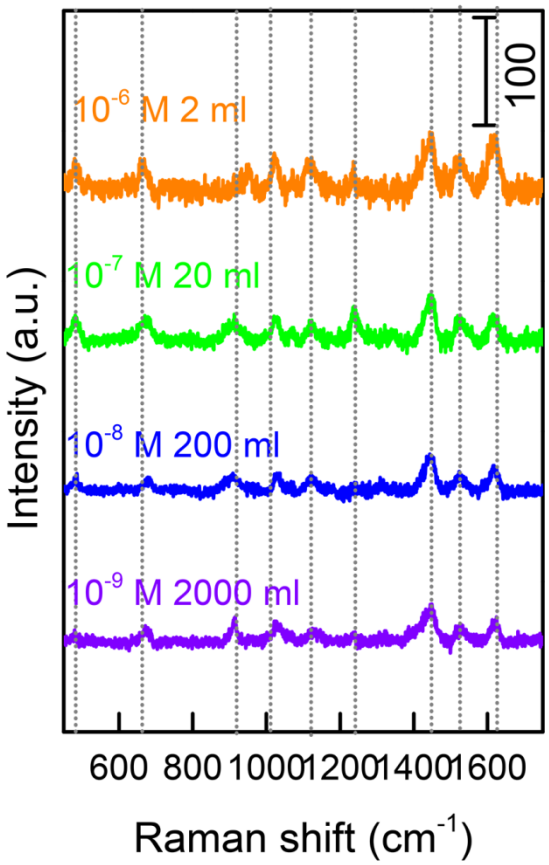

Fig. S10 Raman spectra of the solutions with the same amount of MB but at different concentrations and volumes.

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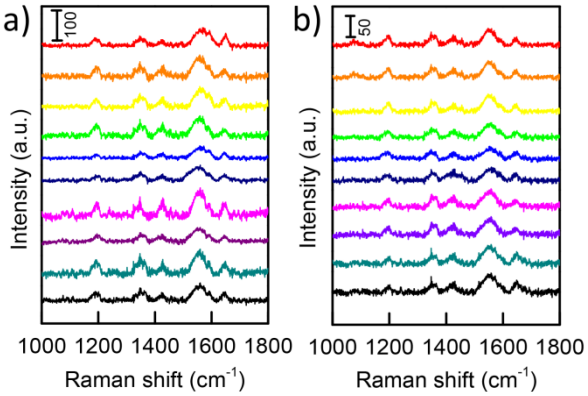

Fig. S11 a) Raman spectra of RhB (10^{-6} M) on ten different spots of BN/Ag membrane. b) Raman spectra of RhB (10^{-6} M) on ten different parts of BN/Ag membrane after 10-cycles reusability test.

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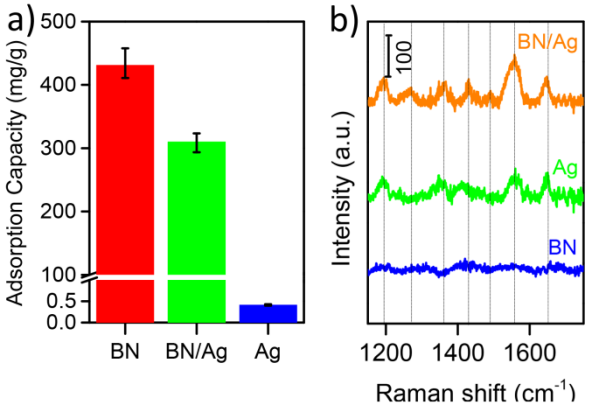

Fig. S12 a) Adsorption capacities of BN, BN/Ag and Ag NPs. b) Raman spectra of RhB (10^{-6} M) on BN/Ag, Ag NPs and BN.