— Supporting Information (Total 7 Pages) —

Aqueously Dispersed Silver Nanoparticle-Decorated Boron Nitride Nanosheets for Reusable, Thermal Oxidation-Resistant Surface Enhanced Raman Spectroscopy (SERS) Devices

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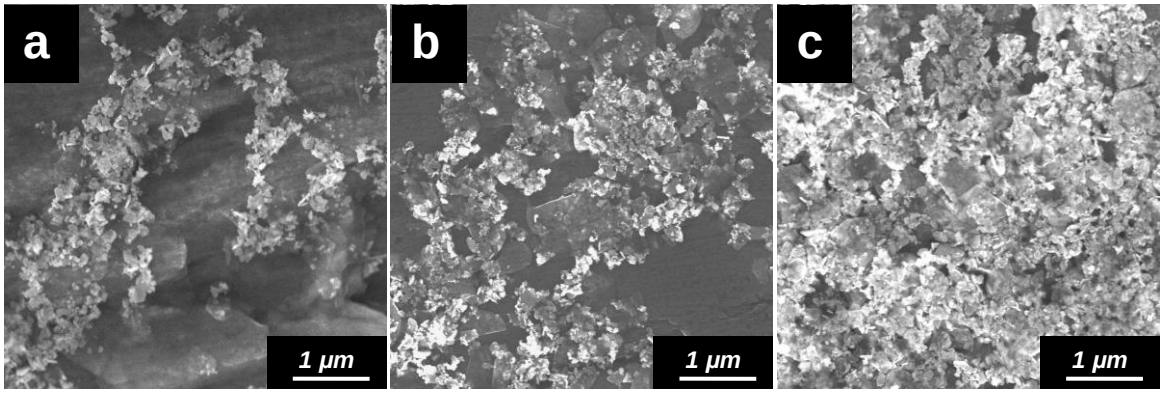

Figure S1. SEM images showing the substrate coverage of the same Type II Ag-BNNS sample from (a) 0.1 mL and (b) 0.5 mL and (c) 1.5 mL of the as-prepared dispersion applied to an area of ~0.64 cm^2 (defined by a PTFE O-ring) in vacuum filtration and subsequently transferred onto aluminum SEM stubs.

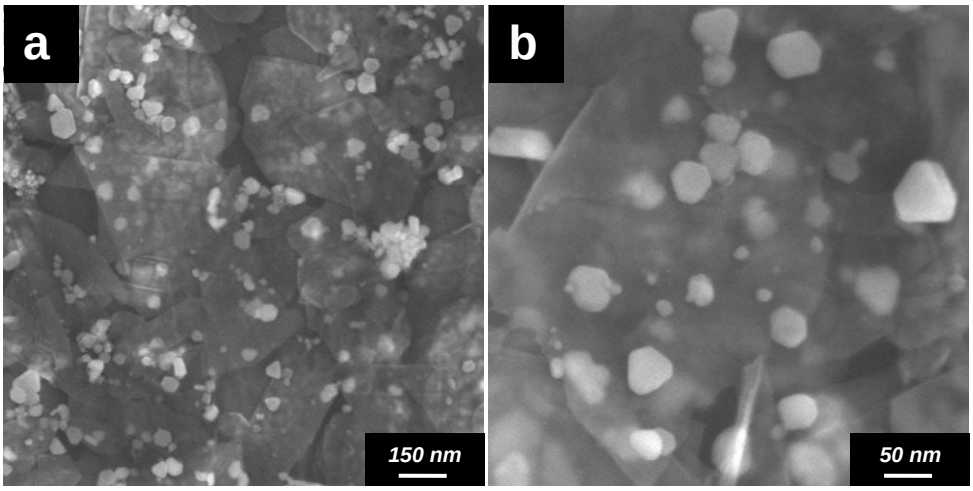

Figure S2. SEM images of a Type I Ag-BNNS thin film transferred onto an aluminum SEM stub at (a) lower and (b) higher magnifications.

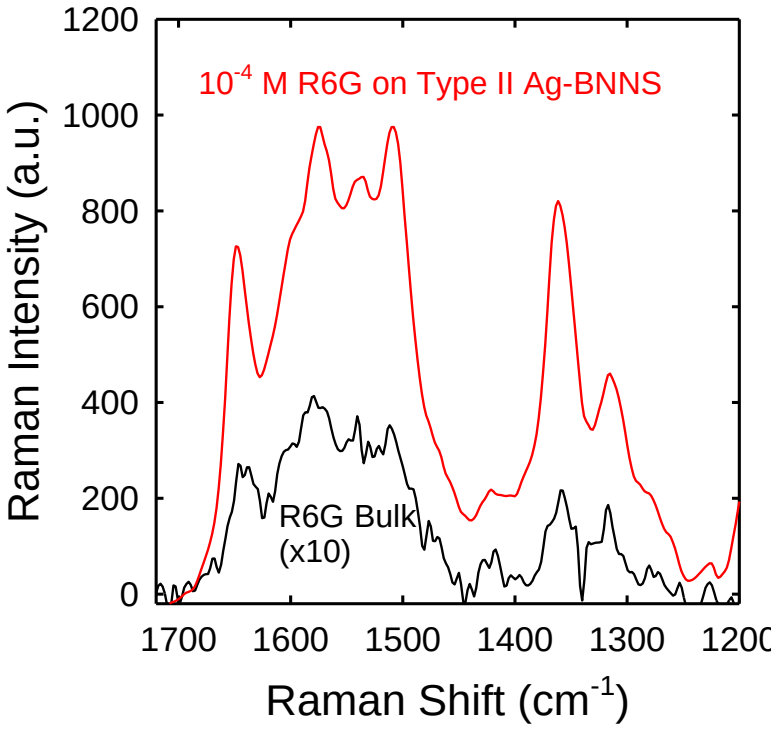

Figure S3. SERS spectrum of a 10-μL 10^{-4} M R6G solution dispensed onto a Type II Ag-BNNS device (baseline-corrected; red) and the Raman spectrum of bulk R6G (baseline-corrected; intensity multiplied by 10; black). In the estimation of the SERS enhancement factor (*EF*), a laser spot size of 20 μm and penetration depth of 1 μm (532 nm, 10× objective) were assumed. Other parameters used in the estimation included the density of R6G (1.26 g/cm^3), the molecular weight of R6G (479.02 g/mol), and the covered surface area by a 10-μL drop (spread beyond the sensing material to a circular area of ~2 cm in diameter). The *EF* value from the above Figure was thus calculated to be ~0.8 × 10^5 by using equation $EF = I_{SERS}N_{bulk}/I_{Raman}N_{surface}$.

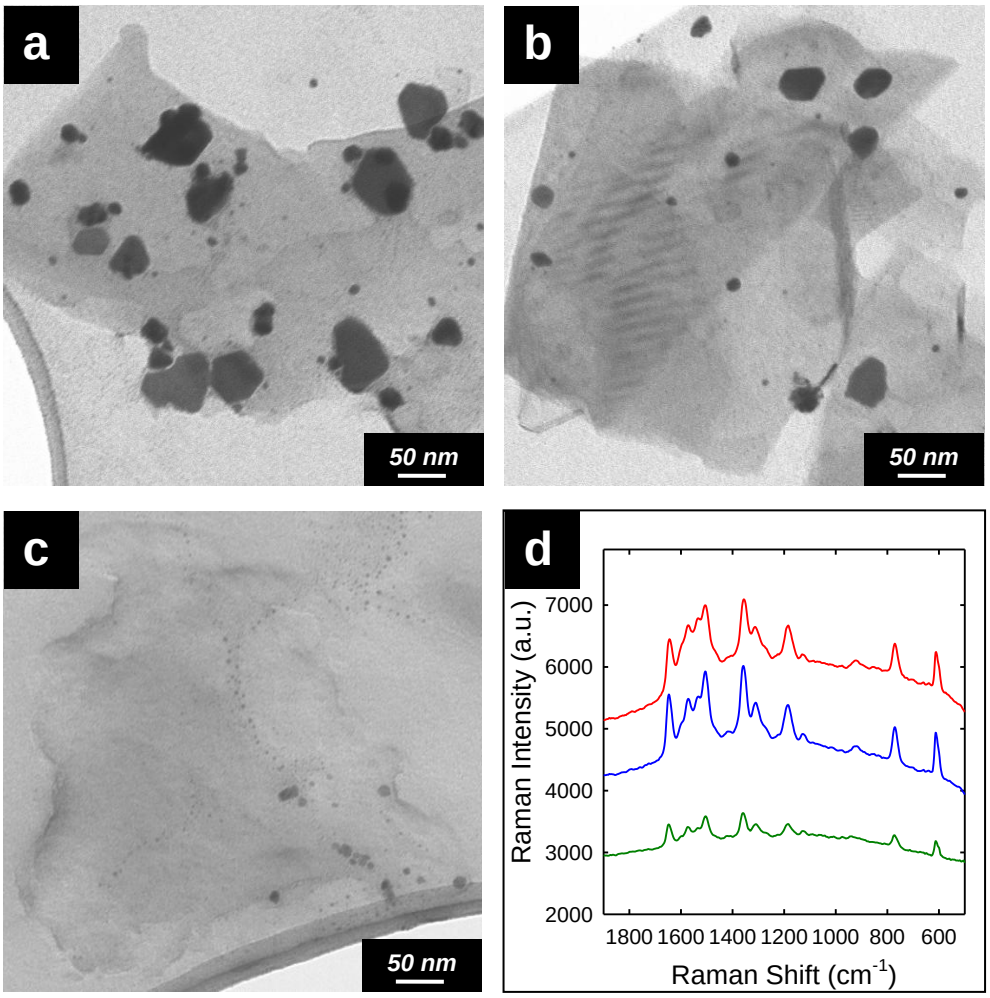

Figure S4. Typical TEM images of Type II Ag-BNNS dispersions showing decreasing average sizes of BNNS-supported Ag nanoparticles from the same addition sequence of the same volumes of (a) 10 mM silver acetate and 2 mM hydrazine; (b) 5 mM silver acetate and 1 mM hydrazine; and (c) 1 mM silver acetate and 0.2 mM hydrazine. (d) shows the SERS spectra of a 10^{-4} M R6G solution with the corresponding devices fabricated from (a) (top/red), (b) (middle/blue), and (c) (bottom/green).

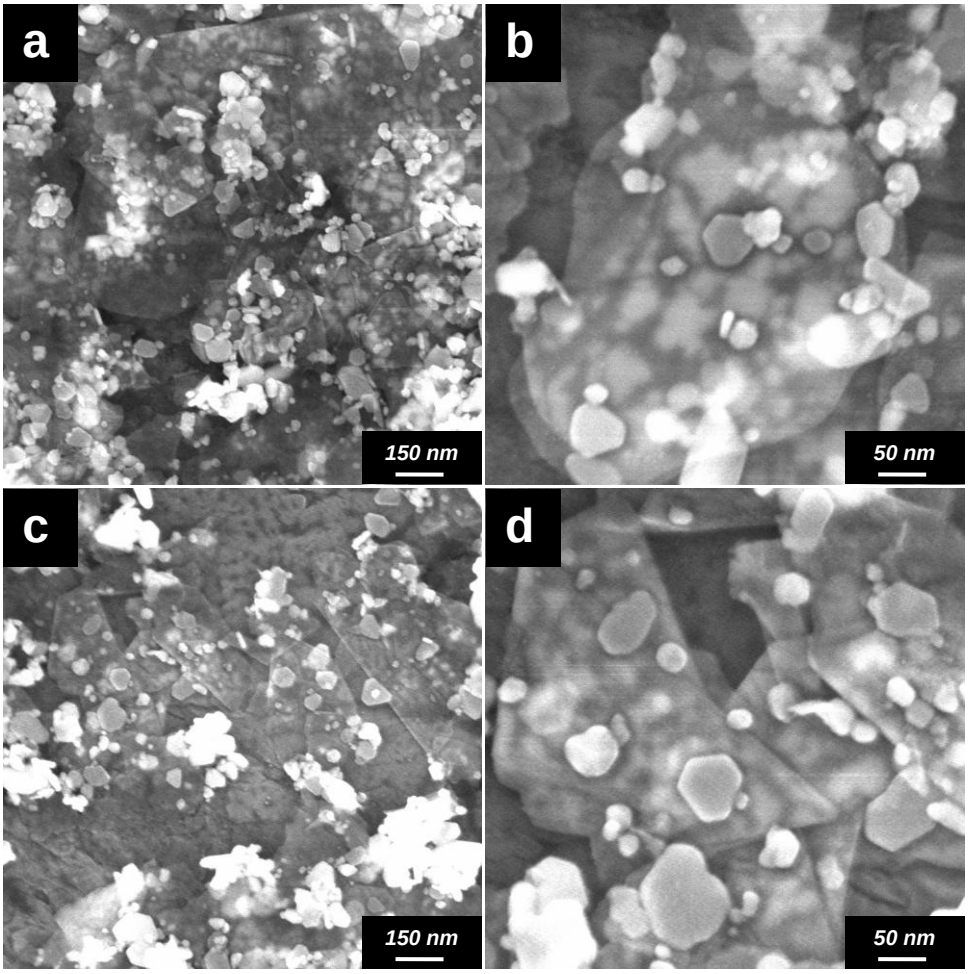

Figure S5. SEM images of a Type II Ag-BNNS thin film transferred on an aluminum SEM stub (a,b) before and (c,d) after prolonged ethanol rinsing.

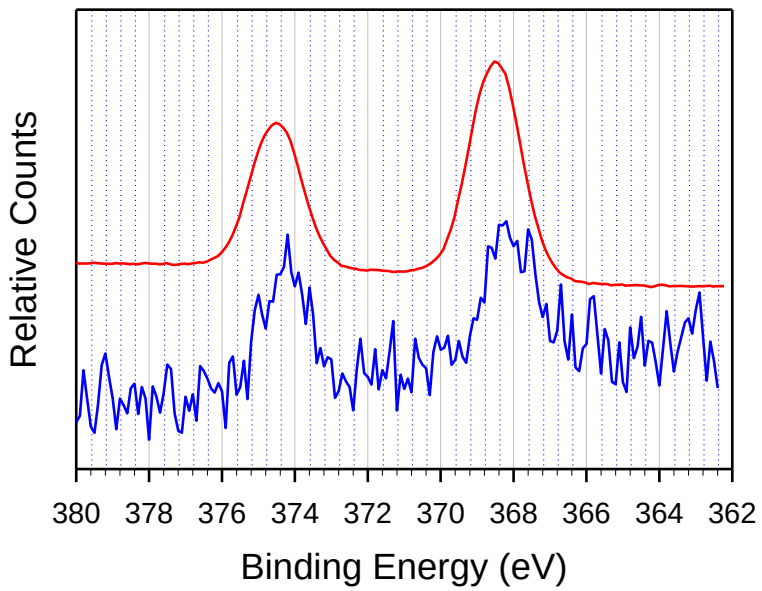

Figure S6. The Ag 3d region of the XPS spectrum of the specimen from the Type II Ag-BNNS device after 30 repeated thermal treatments (top/red) in comparison to that of a specimen from another Type II device without any thermal treatments (bottom/blue).

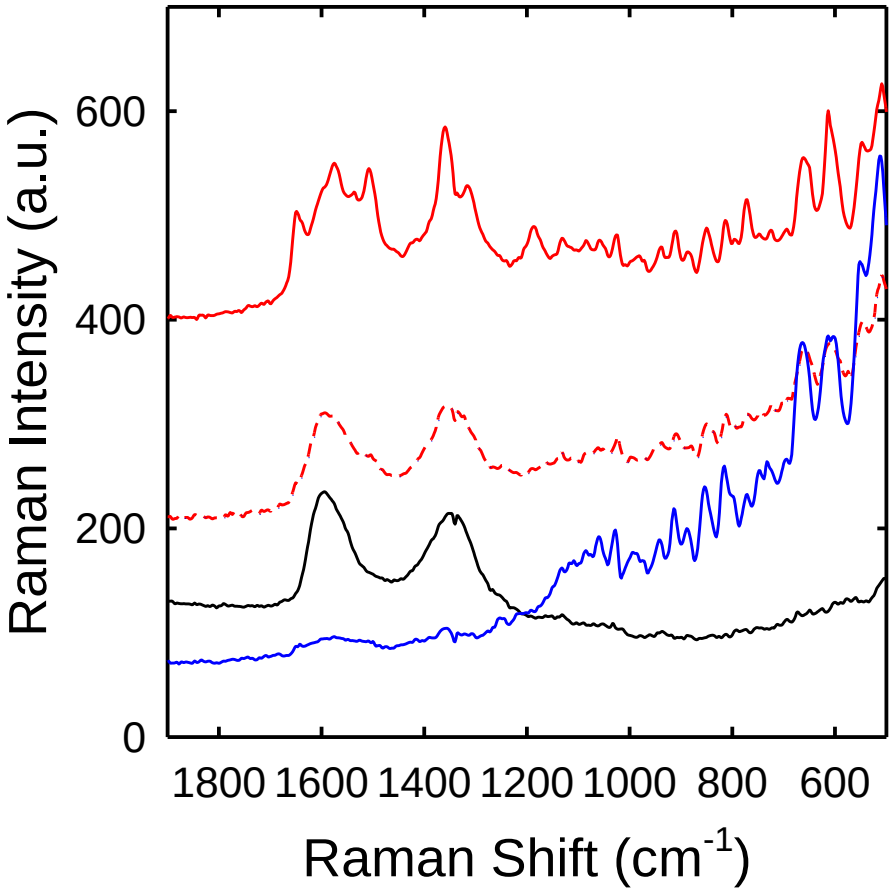

Figure S7. SERS spectra of R6G solutions of 10^{-5} (red dashed) and 10^{-4} M (red solid) in ethanol using a Ag-GO device fabricated following the exact same procedure as that for Type II Ag-BNNS devices for Figures 4-6. The Raman/SERS spectrum for the blank Ag-GO device (black) is shown for comparison. The SERS spectrum of a 10^{-4} M R6G solution for the same device after further treatment at 400 ℃ in air for 2 min is also shown (blue).