

Supporting Information

Silver Nanoparticles Embedded Hydrogel as a Substrate for Surface Contamination Analysis by Surface-Enhanced Raman Scattering

Zhengjun Gong,¹ Canchen Wang,^{1,2} Cong Wang,² Changyu Tang,² Fansheng
Cheng,² Hongjie Du,^{1,2} Meikun Fan,^{1*} and Alexandre Brolo^{3*}

¹Faculty of Geosciences and Environmental Engineering, Southwest Jiaotong
University, Chengdu, Sichuan, 610031, China.

²Chengdu Green Energy and Green Manufacturing R&D Centre, Chengdu, Sichuan,
610207, China

³Department of Chemistry, University of Victoria, PO Box 3055, Victoria, BC V8W
3V6, Canada

E-mail: meikunfan@gmail.com, agbrolo@uvic.ca

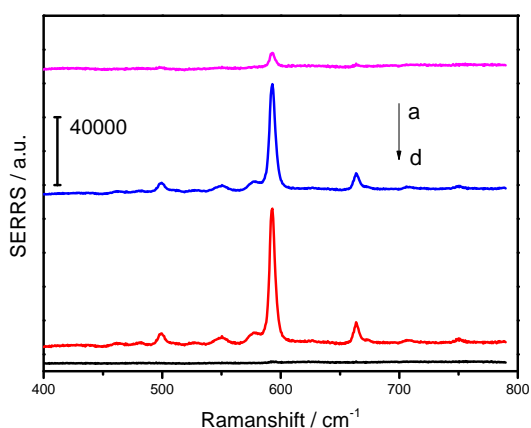


Figure s1. Effect of PVA concentration on SERS performance: (a-d) 8%, 6%, 4%, 2% PVA (w:w), respectively. Laser power, 300 μ W; Integration time, 500 ms \times 5.

From Fig. s1 it is clear that 4~6% of PVA gives the best SERS signal of the Raman probe NBA.

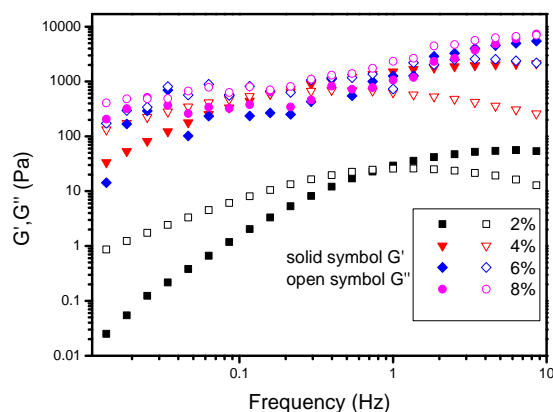


Figure s2. Angular frequency dependence of moduli G' and G'' for SERS slime substrates at various PVA weight percentage (indicated in the Figure). Ag NPs: 5 mM. Borax 4% (w:w) was mixed with the PVA-Ag NPs mixtures at 3:10 ratio (V:V). The diameter of the plate is 40 mm. The interval between the upper and lower plates is 1 mm and the test temperature is 25 °C.

Figure s2 shows the angular frequency dependence of storage modulus (G') and loss modulus (G'') for PVA/Ag NPs mixture with various PVA concentrations at constant borax content. It is clear that at relatively low PVA concentrations (2 and 4%), G' is smaller than G'' at low frequency regime ($\omega < 1$) and G' is beyond G'' after a crossover point, which is attributed to the formation of weak gel network (sol-gel transition) by PVA complexation with borate ions.^{1,2} With the increase of the PVA concentrations (e.g., 4%), the G' increases and the crossover point shifts toward lower frequency, indicating the increased cross-linking degree of PVA gel due to more PVA chain entanglements between cross-linker (borate).² Particularly, when the PVA concentration is over 6%, G' and G'' curves become almost parallel and present

typical solid-like behavior (i.e. PVA solution nearly loses its flow ability) at all frequency regime.^{2,3} In this case, the independence of both moduli on tested frequency suggests the formation of more continuous and compact cross-linked network in the PVA solution, where the PVA chain relaxation is seriously restricted by the chain entanglement and cross-linking with borate.⁴

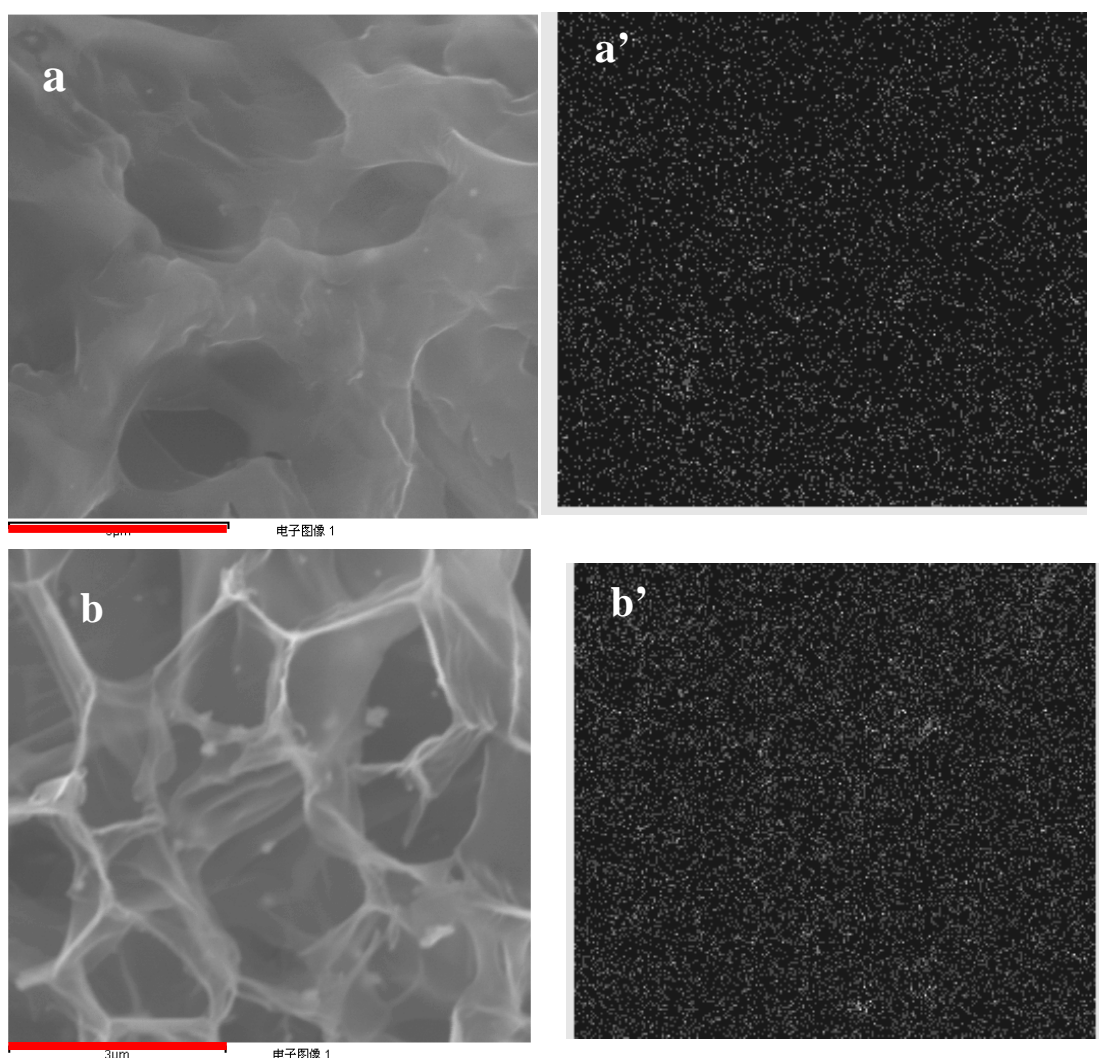


Figure S3. Representative SEM of the freeze-dried slime SERS substrate (Scale bar (red) stands for 3 μm) before (a) and after (b) concentrated by a factor of 6 by

centrifugation. a' and b', EDX mapping of element Ag of the same area of a and b. Average Ag atomic percentage was found to be 0.12% in a(before centrifugation) and 0.65% in b (after centrifugation), respectively.

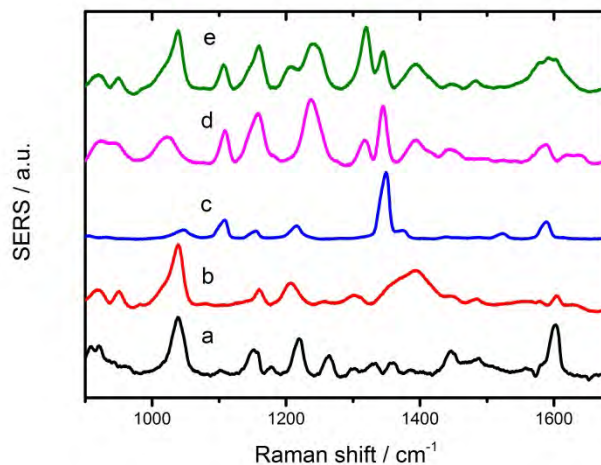


Figure S4. a and c, normal Raman of isocarbophos and methyl parathion solid, respectively; b, d, and e, SERS stamping test of 10 μL of 100 ppm (1 μg) of isocarbophos, parathion, and their mixture on glass, respectively.

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