

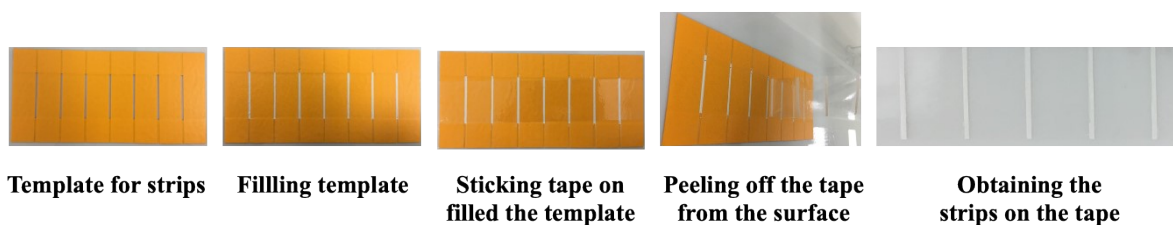
Electronic Supplementary Information

**Layer-by-layer coating of natural diatomite with silver nanoparticles for  
identification of circulating cancer protein biomarkers using SERS**

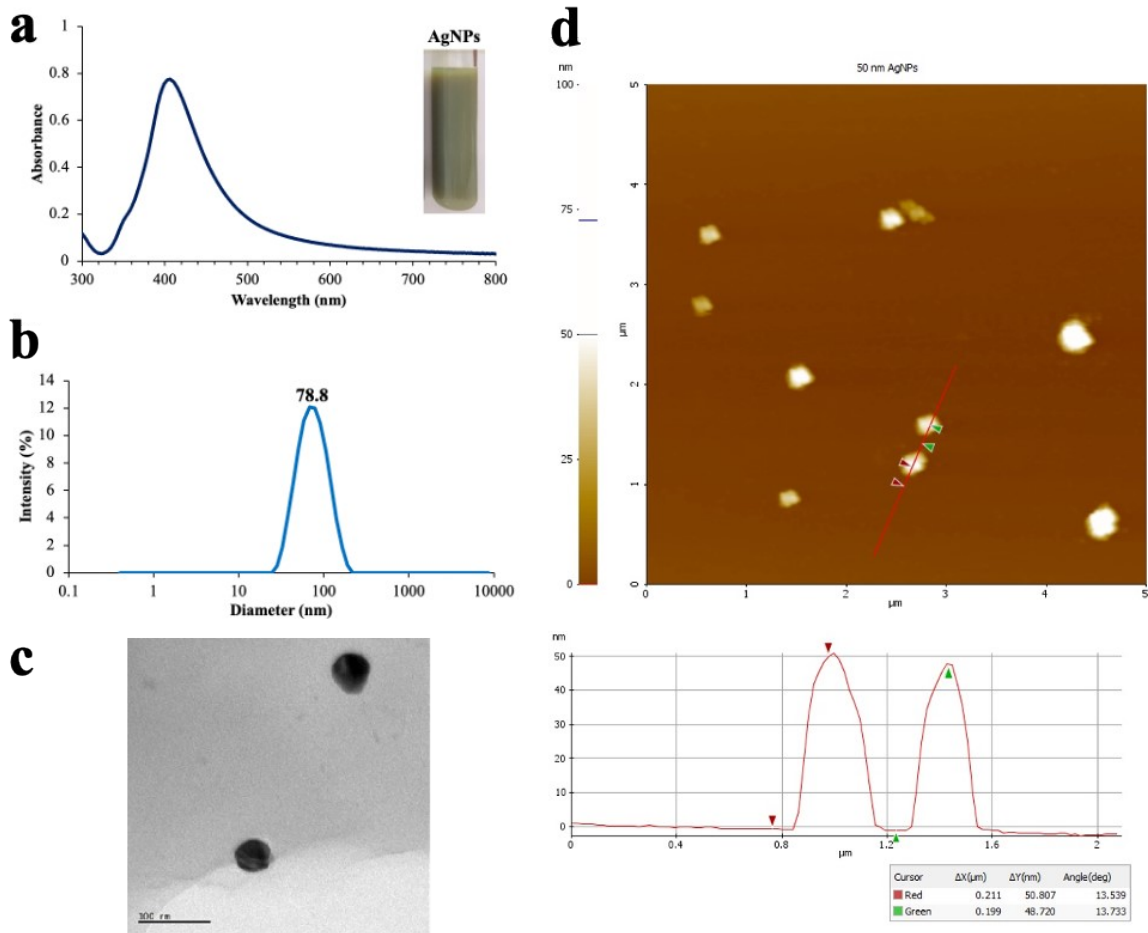
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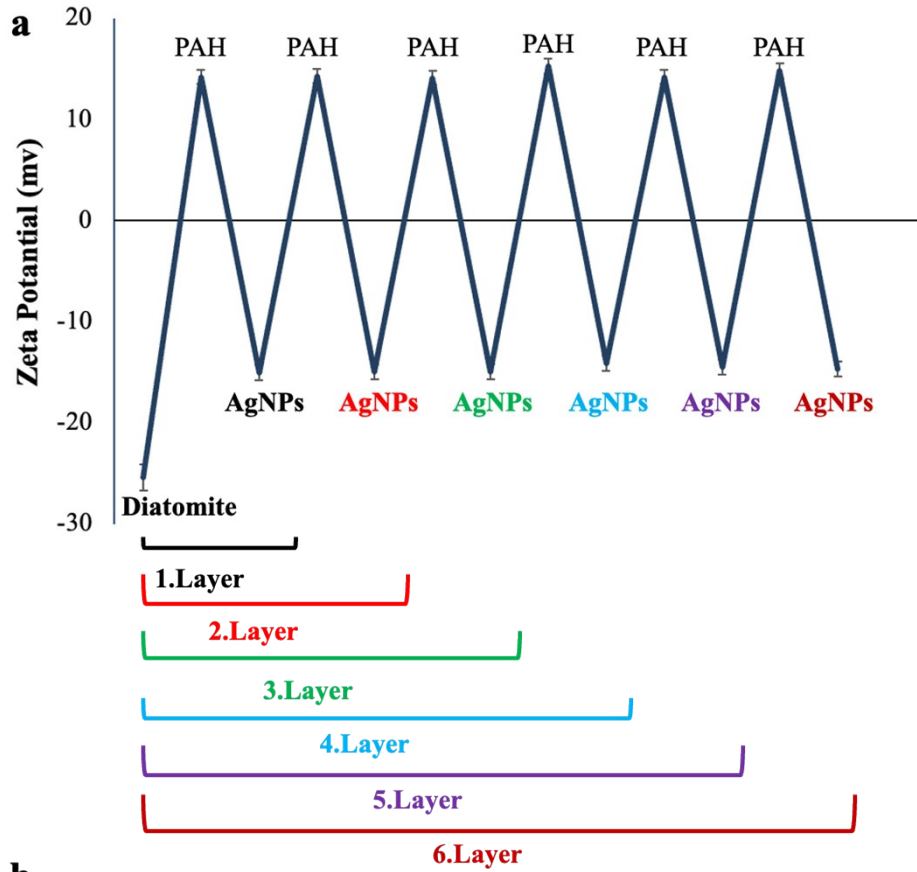
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**Figure S1.** Photos of templates and procedures for the fabrication of SERS active strips on a regular box tape.



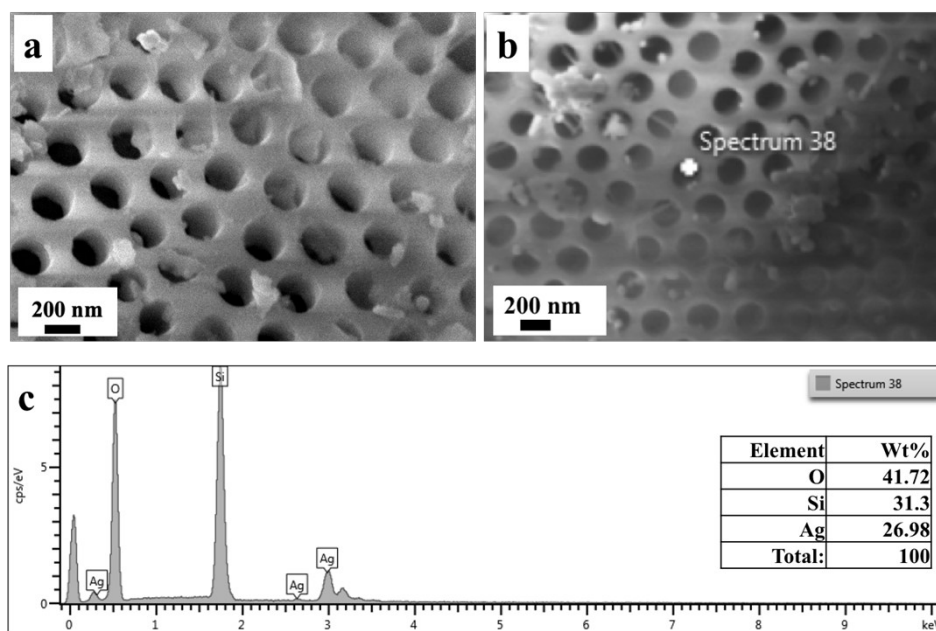
**Figure S2. a)** UV/Vis. absorption spectrum and suspension color, **b)** particle size distribution graph, **c)** TEM image, **d)** AFM images and line profile analysis of synthesized AgNPs.



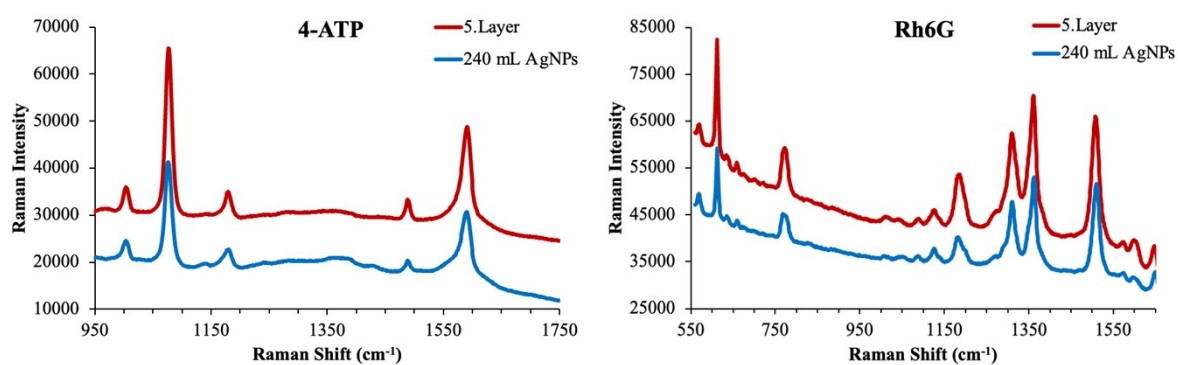
**b**

Diatomite	1. Step	2. Step	3. Step	4. Step	5. Step	6. Step	7. Step	8. Step	9. Step	10. step	11. Step	12. Step
-25.4	14.2	-15.0	14.3	-14.9	14.1	-14.9	15.3	-14.1	14.2	-14.5	14.8	-14.7

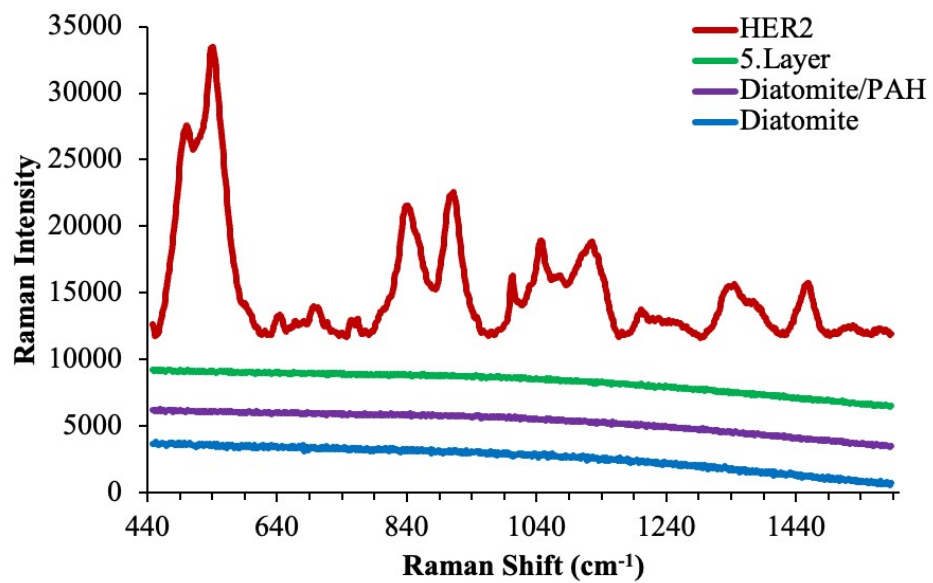
**Figure S3.** Zeta potential changes of diatomite and each step for the fabrication of nanocomposites with different layers **(a)** and zeta potential values obtained from each step **(b)**.



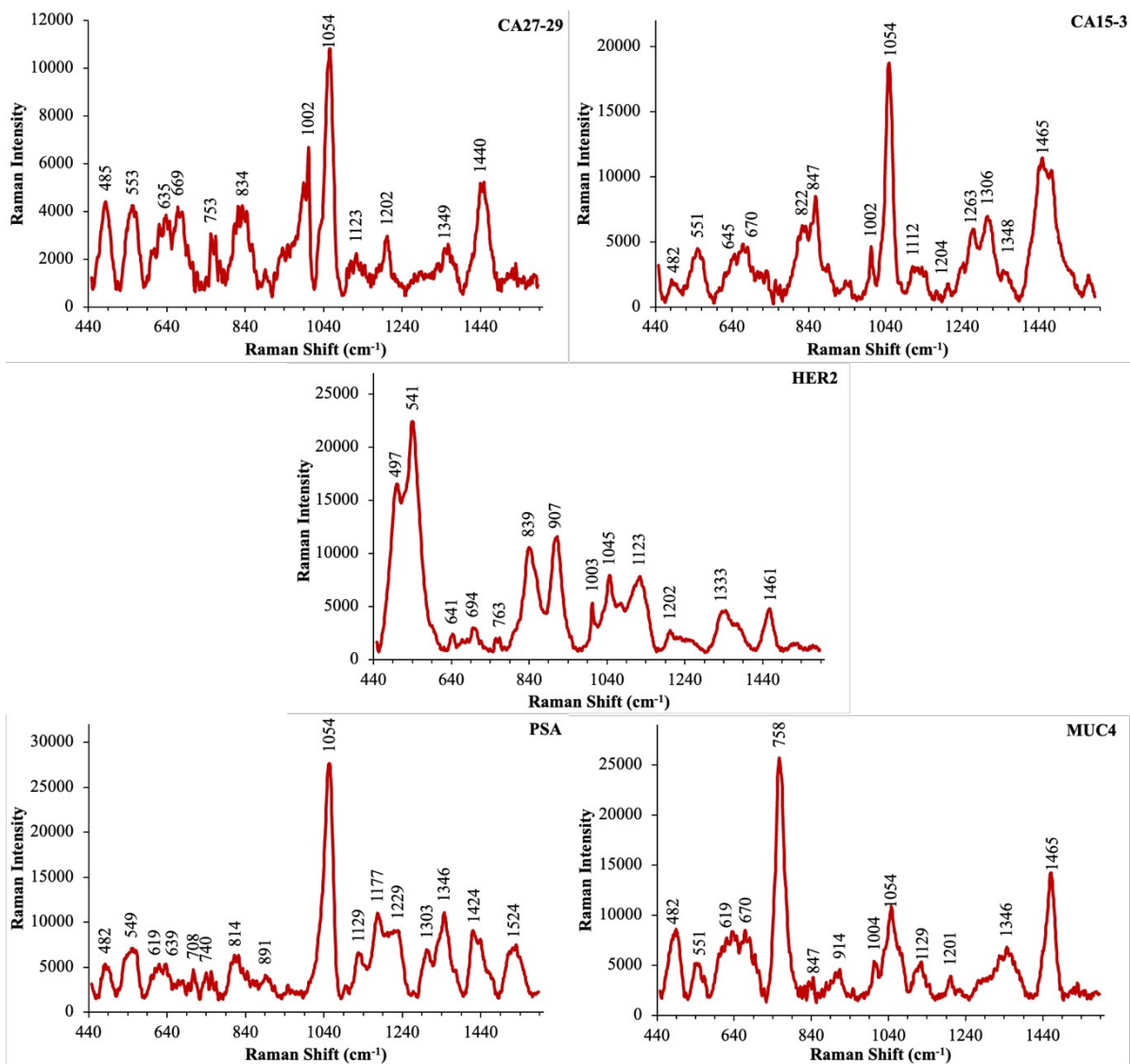
**Figure S4.** SEM image of empty diatomite (a) and SEM image (b) with EDS spot spectrum (c) of silver nanoparticles in diatomite pores.



**Figure S5.** Comparison of the SERS spectra of 4-ATP and Rh6G on the strips prepared by simple mixing and using the LbL method.



**Figure S6.** The comparison of SERS spectra obtained from the backgrounds and HER2 biomarker.



**Figure S7.** Individual SERS spectrum obtained from each protein.

**Table S1.** Peak positions and tentative peak assignments for the SERS spectra of the cancer protein biomarkers.

Raman Shift (cm <sup>-1</sup> )					Proteins
CA27-29	CA15-3	HER 2	MUC 4	PSA	
485	482	497	482	482	<b>Cysteine</b>
553	551	541	551	549	<b>Tryptophan</b>
-	-	-	619	619	<b>Phenylalanine</b>
635	645	641	-	-	<b>Tyrosine</b>
669	670	-	670	-	<b>C-C protein</b>
753	-	763	758	740	<b>Tryptohan</b>
834	847	839	847	814	<b>Tyrosine</b>
-	-	907	914	-	<b>Tryptohan</b>
1002	1002	1003	1004	-	<b>Phenylalanine</b>
1054	1054	1045	1054	1054	<b>C-N ve C-O Protein</b>
1123	1112	1123	1129	1129	<b>C-N Protein</b>
1202	1204	1202	1201	1229	<b>Tyrosine+Phenylalanine</b>
1349	1348	1333	1346	1346	<b>Tryptohan</b>
1440	1465	1461	1465	1424	<b>CH<sub>2</sub> Protein</b>

**Table S2.** a) Summary result for the peak intensity comparison at around 1123 cm<sup>-1</sup>, and b) all calculated p-values using ANOVA.

**a**

SUMMARY				
Groups	Count	Sum	Average	Variance
CA 27-29	10	10079.50	1007.95	138743.28
CA15-3	10	18934.09	1893.41	1307340.20
HER2	10	91439.84	9143.98	592651.09
MUC4	10	53658.58	5365.86	812919.52
PSA	10	45578.65	4557.87	2762359.11

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	412519911.15	4.00	103129977.79	91.85	0.00	2.58
Within Groups	50526118.86	45.00	1122802.64			
Total	463046030.02	49.00				

**b**

Raman Shift (cm <sup>-1</sup> )	487	551	834	1054	1123	1349	1440
<b>P-value</b>	7.34E-22	9.55E-24	8.13E-26	2.58E-14	4.74E-21	4.91E-17	4.22E-07