Electronic Supplementary Material (ESI) for Materials Advances.

Aluminum sheet induced zinc oxide nanosheets decorated with silver nanoparticles for ultrasensitive SERS sensing of crystal violet

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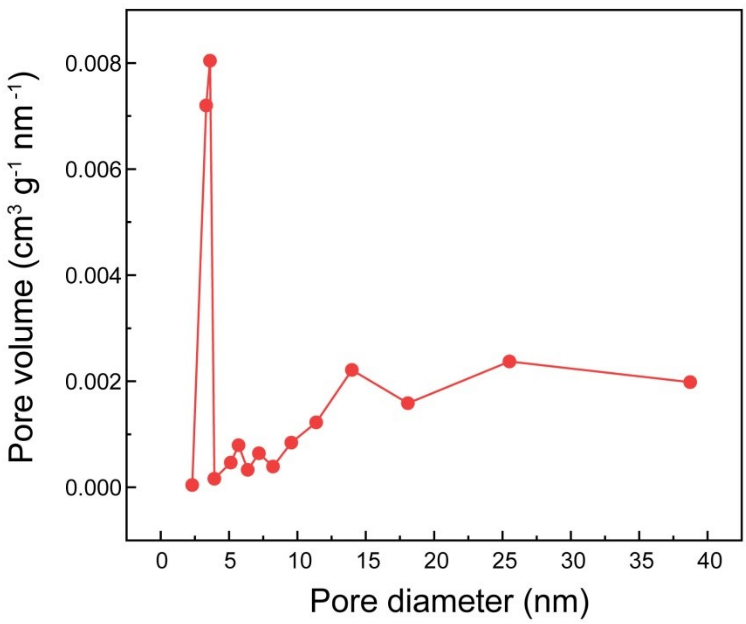


Fig. S1 Pore diameter distribution of Al/ZnO.

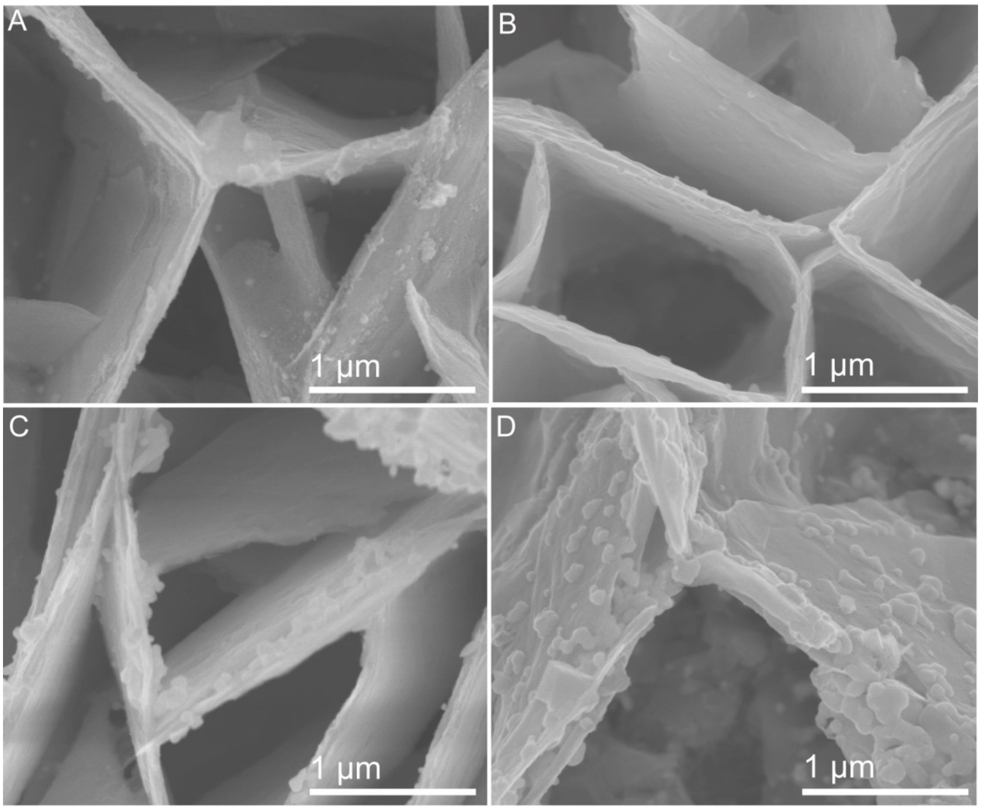


Fig. S2 (A ~ D): SEM images of Al/ZnO/Ag at other reduction times (5, 10, 20 and 30 min).

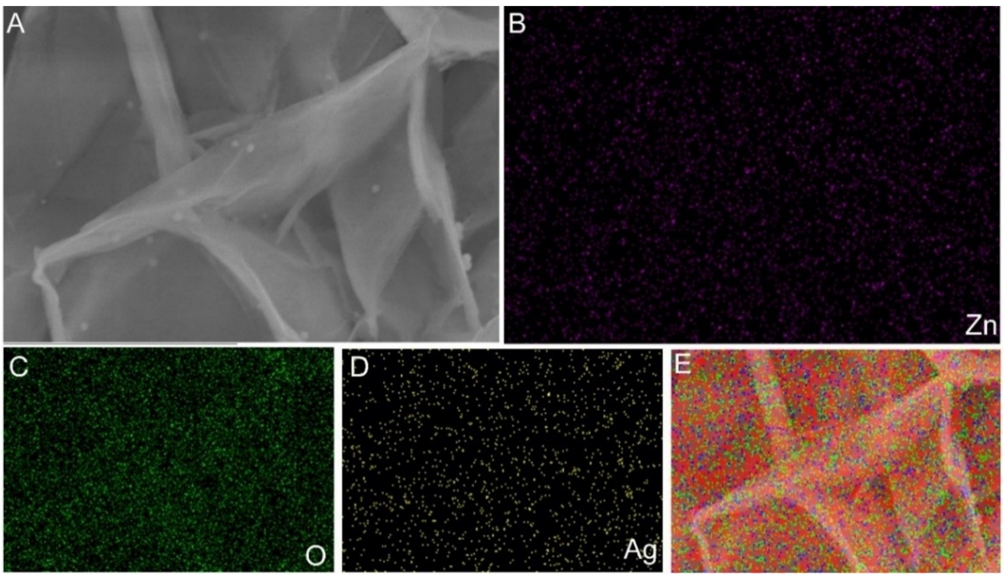
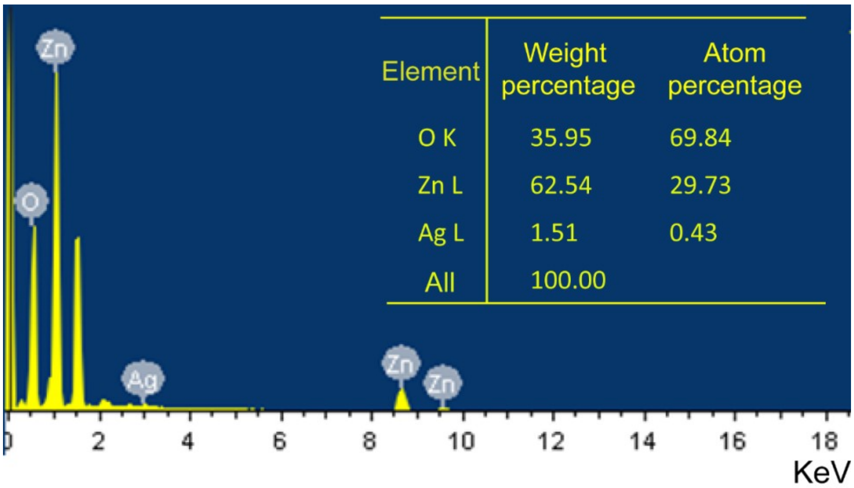


Fig. S3 (a) Energy-filtered SEM image of the Al/ZnO/Ag; Elemental distribution of Zn (B), O (C) and Ag (D); and the overlay distribution of elements (E).



Element	Weight percentage	Atom percentage
O K	35.95	69.84
Zn L	62.54	29.73
Ag L	1.51	0.43
All	100.00	

Fig. S4 EDX analysis of the Al/ZnO/Ag.

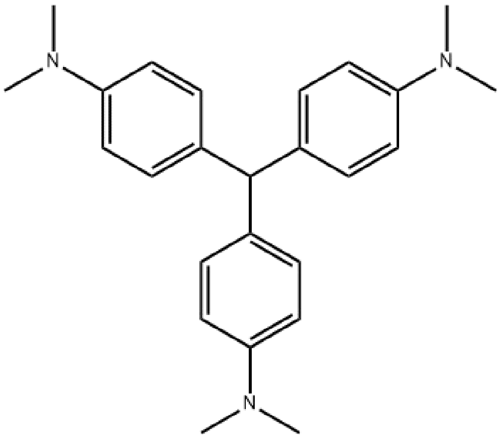


Fig. S5 The structure of CV.

In addition, the analytical enhancement factor (AEF) of the substrate can be estimated according to the peak at 1609 cm^{-1} by the following formula: [1]

$$AEF = (I_{SERS}/C_{SERS})/(I_{RS}/C_{RS})$$

Where I_{SERS} is the SERS intensity of CV at the concentration of C_{SERS} (1×10^{-7} $mol \cdot L^{-1}$) on the Al/ZnO/Ag substrate. I_{RS} is the Raman intensity of the CV at the concentration of C_{RS} (1×10^{-3} $mol \cdot L^{-1}$) on Al sheet. Thus, the AEF is estimated as 2.45×10^{8} for the Al/ZnO/Ag.

Table S1 The comparison of SERS performance toward CV on various substrates.

Materials	Analyte	LOD	EF
Cellophane/Ag[2]	CV	1×10^{-9} mol·L^{-1}	2.0×10^{5}
Paper-based Au/AgNP[3]	CV	8.1×10^{-8} mol·L^{-1}	-
Ag/CdS[4]	CV	1×10^{-12} mol·L^{-1}	1.0×10^{7}
Au@Ag-frustum arrays[5]	CV	1×10^{-10} mol·L^{-1}	2.67×10^{7}
This work	CV	3.6×10^{-14} mol·L^{-1}	2.45×10^{8}

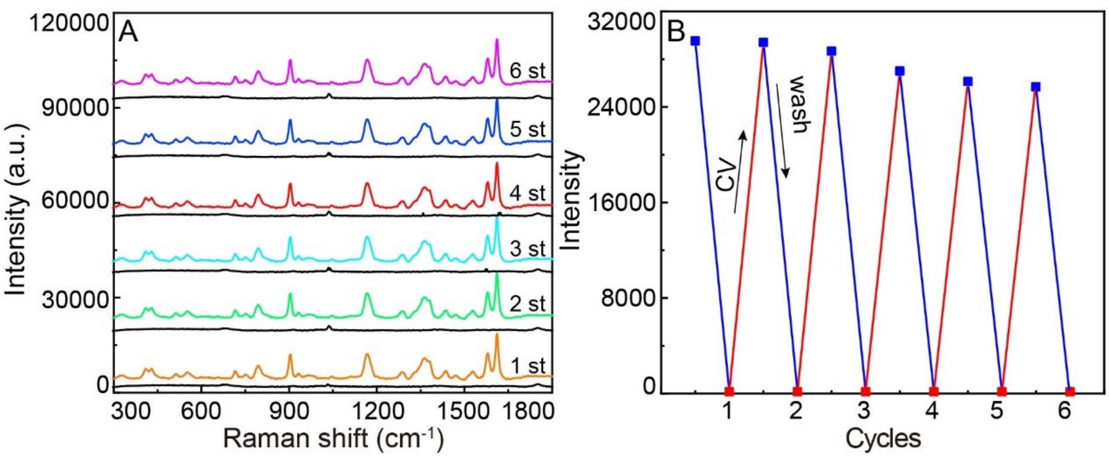


Fig. S6 (A) SERS spectra of the CV (1×10^{-7} mol·L^{-1}) on the same Al/ZnO/Ag substrate for 6 cycles and (B) the line chart of SERS intensity at 1609 cm^{-1} with cycle.

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