Electronic Supplementary Material (ESI) for Nanoscale.

Ag Decoration on $Na_2Ti_3O_7$ Nanowires for Improved SERS and PHE Performance

Lei Chen,[a] Yang Jin,*[b] Shuang Guo,[c] Eungyeong Park,[c] Yunfei Xie*[b] and Young Mee Jung*[c]

[a] *School of Materials Science and Engineering, Jilin Jianzhu University, Changchun 130118, China.*

[b] *School of Food Science and Technology, Jiagnan University, Wuxi, Jiangsu 214122, China.*

[c] *Department of Chemistry, Institute for Molecular Science and Fusion Technology, Kangwon National University, Chunchon 24341, Korea.*

*To whom correspondence should be addressed.

jy1165254033@163.com, xieyunfei@jiangnan.edu.cn, ymjung@kangwon.ac.kr

Table S1. Assignments of SERS bands of MBA

Raman shift (cm^{-1})		Band assignments[1]
633 nm	514 nm	
999	998	Non-totally symmetric υ(CC), b_2
1013	1012	Non-totally symmetric υ(CC), b_2
1076	1077	In-plane ring breathing +υ(C–S), a_1
1138		υ(CH), b_2
1182	1181	υ(CH), a_1
1365	1362	Asymmetric $\upsilon(COO^-)$
1586	1586	Totally symmetric υ(CC), a_1

υ, stretching; β, bending. For ring vibrations, the corresponding vibrational modes of benzene and the symmetry species under $C_{2\upsilon}$ symmetry are indicated, where a_1 and b_2 represent totally and non-totally symmetric vibrational modes of the molecules, respectively.

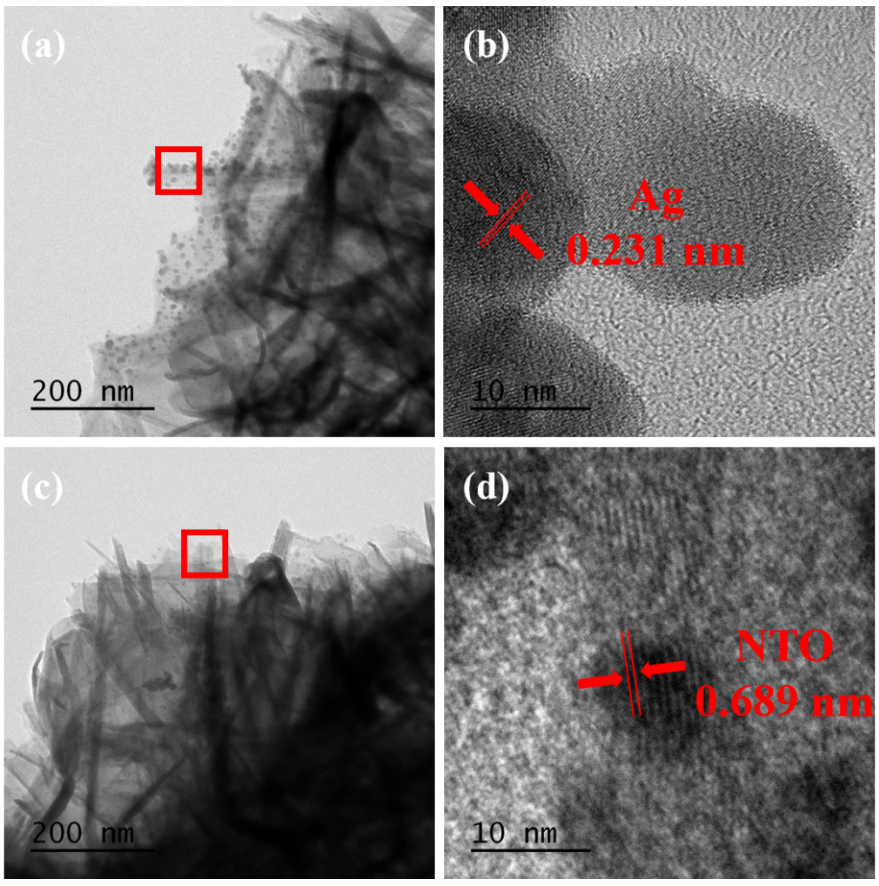

Fig. S1. (a), (c) High-magnification TEM images and (b), (d) the lattice spacings of Ag-NTO nanowires.

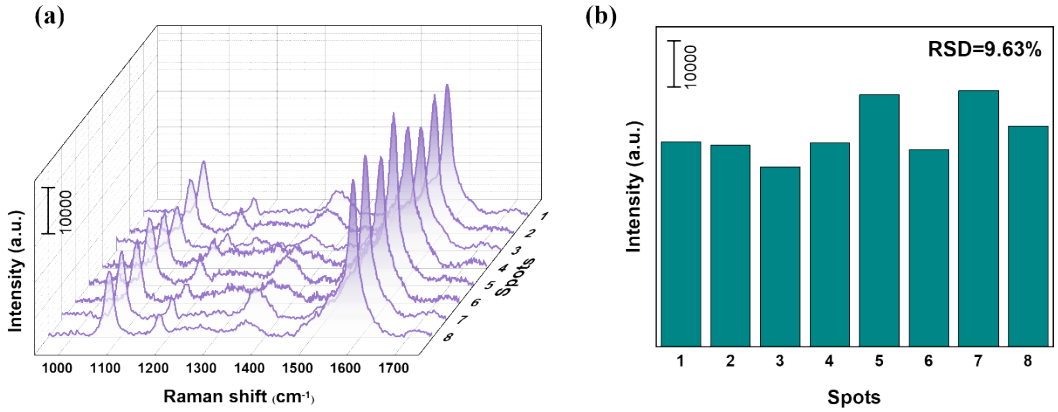

Fig. S2. (a) SERS spectrum of 10^{-3} M MBA adsorbed on Ag-NTO-3 obtained with 514 nm excitation light. (b) RSD of the band intensity at 1591 cm^{-1}.

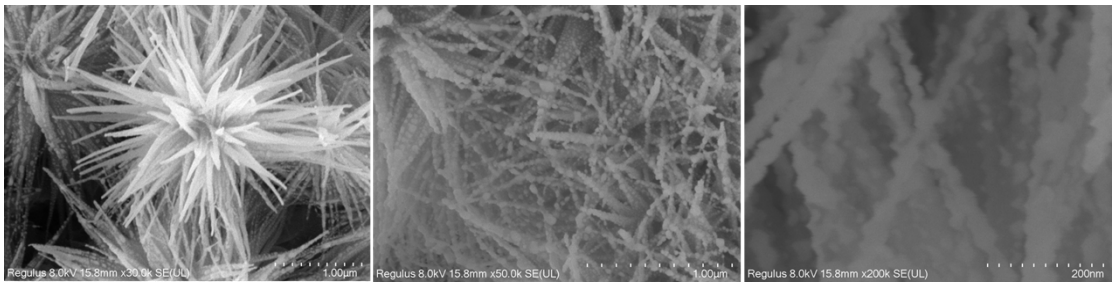

Fig. S3. SEM images of sea urchin-shaped nanostructure after four PHE cycles.

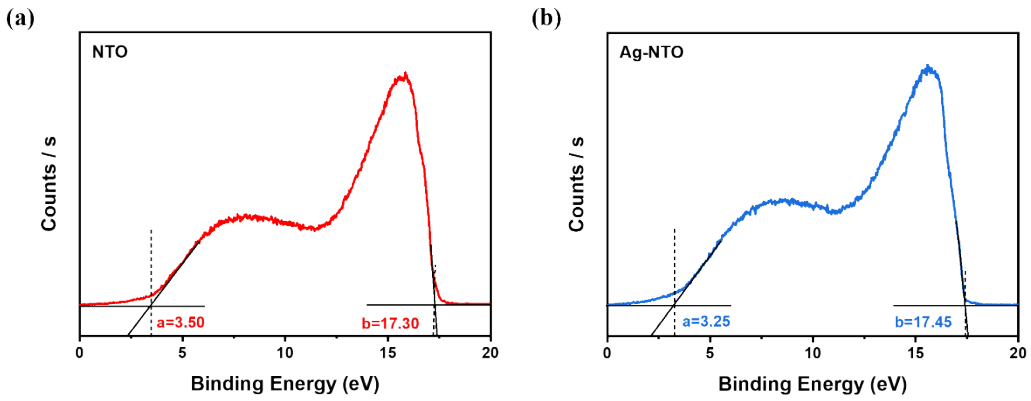

Fig. S4. UPS spectra of (a) NTO and (b) Ag-NTO.

CB and VB Energy Determination. The band gap positions of the Ag/ITO systems were calculated according to the following equations:

$$W_F = h\upsilon - \Delta E \quad (1)$$

$$VB = W_F + b \quad (2)$$

$$CB = VB - E_g \quad (3)$$

where, hν is 21.22 eV, ΔE is the tangent value a in the graph, and the values a and b are both obtained by taking the tangent. The VB levels of NTO and Ag-NTO can be calculated as 7.42 and 7.02 eV (vs. vacuum), respectively. Furthermore, the calculated VB levels are 2.92 and 2.52 eV (vs. NHE), respectively.

References

1 B. Han, L. Chen, S. Jin, S. Guo, J. Park, H. S. Yoo, J. H. Park, B. Zhao and Y. M. Jung, Modulating Mechanism of the LSPR and SERS in Ag/ITO Film: Carrier Density Effect, *J. Phys. Chem. Lett.*, 2021, **12**, 7612–7618.