

Supplementary Material

Improved Surface-enhanced Raman Scattering Properties of ZrO₂ Nanoparticles by Zn Doping

Peng Ji^{1,2}, Zhu Mao², Zhe Wang¹, Xiangxin Xue³, Yu Zhang², Jiaao Lv¹ and Xiumin Shi^{1,*}

¹ College of Chemical Engineering, Changchun University of Technology, Changchun, China

² School of Chemistry and Life Science, Changchun University of Technology, Changchun, China

³ Key Laboratory of Preparation and Applications of Environmental Friendly Materials, Jilin Normal University, Ministry of Education, Changchun, China

* Correspondence: shixiumin@ccut.edu.cn; Tel.: +86-431-8571-6463

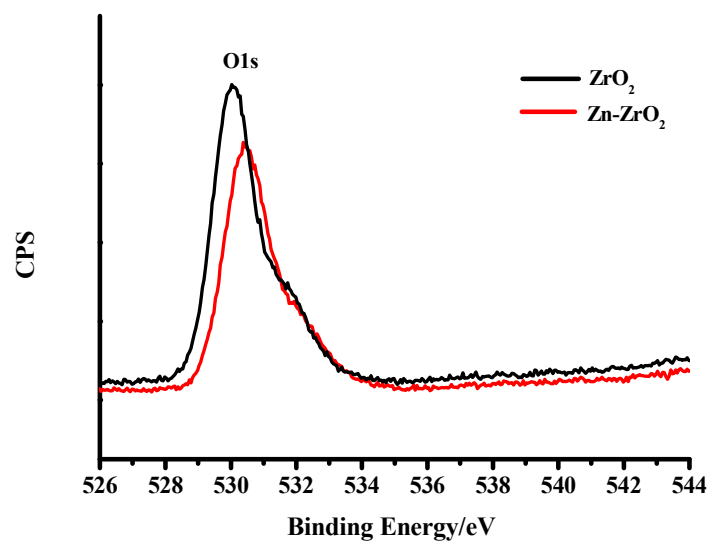


Figure S1. XPS spectra of O1s in ZrO_2 and Zn-ZrO_2 (1%) NPs.

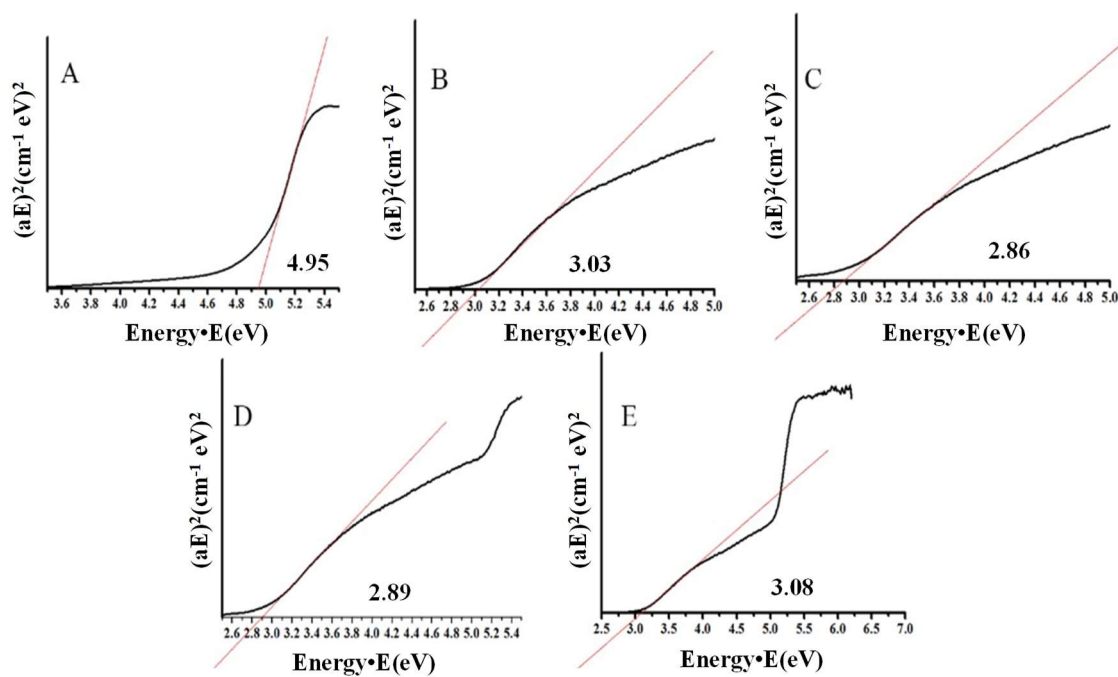


Figure S2. UV-vis DRS spectra of (A) pure ZrO_2 nanoparticle, and Zn-doped ZrO_2 nanoparticle (B) 0.5%, (C) 1%, (D) 3%, and (E) 5%.

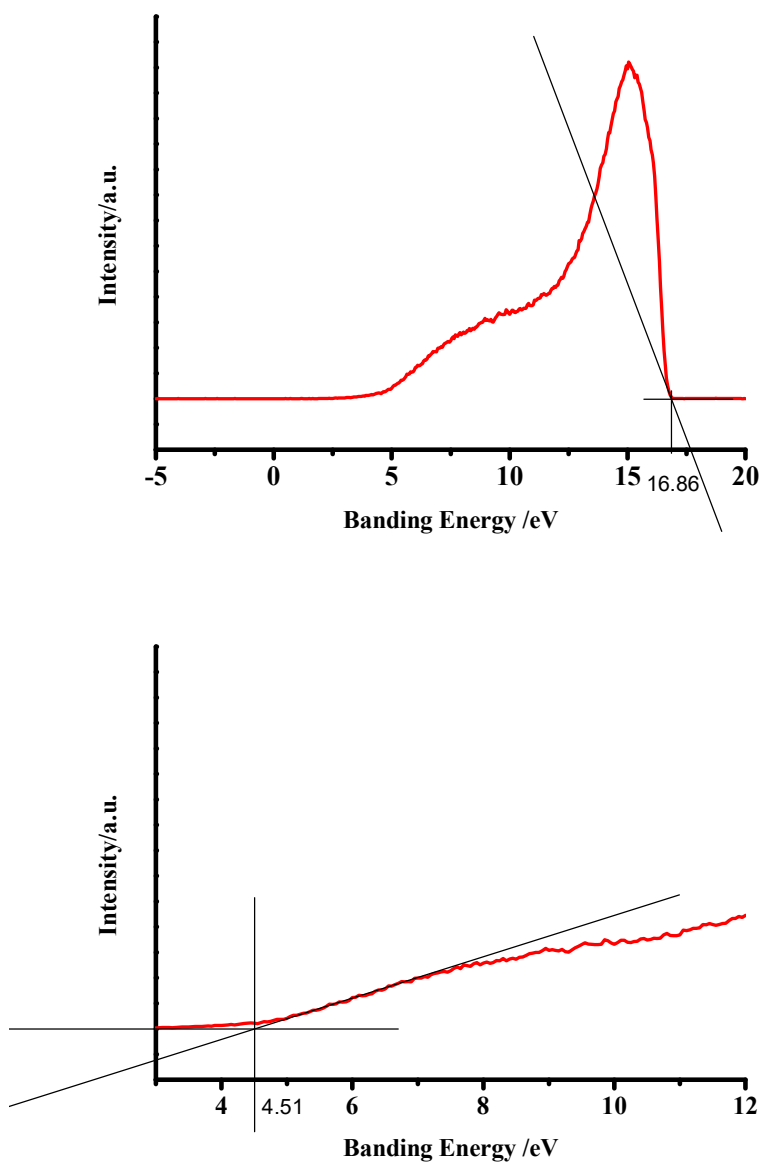


Figure S3. The ultraviolet photoelectron spectroscopy (UPS) of Zn-ZrO₂ (1%) nanoparticles.

Through the formula: $WF=h\nu-\Delta E$. According to Figure S3, the work function of Zn-ZrO₂ is 4.36 eV and the VB of Zn-ZrO₂ is situated at 8.87 eV. As the S2 shows, the UV-vis absorption band located at 433 nm. Thus, the band gap between VB and CB is 2.86 eV. The CB of Zn-ZrO₂ is situated at 6.01 eV.

Table S1 Enhancement factor of 4-MBA adsorbed on ZrO₂ and Zn-ZrO₂ NPs (0.5%, 1%, 3%, and 5%).

Zn-ZrO ₂ /n%	0	0.5	1	3	5
EF	4.32×10^3	1.34×10^4	1.94×10^4	1.57×10^4	1.56×10^4