

Supplementary Materials

Hydrothermal Fabrication of Spindle-Shaped ZnO/Palygorskite Nanocomposites Using Nonionic Surfactant for Enhancement of Antibacterial Activity

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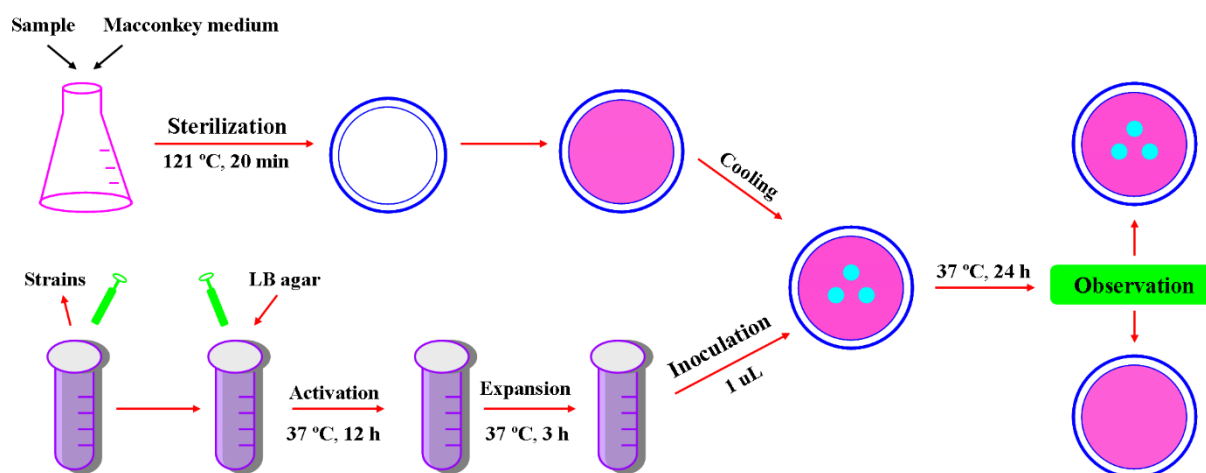


Figure S1. Schematic illustration for the antibacterial test.

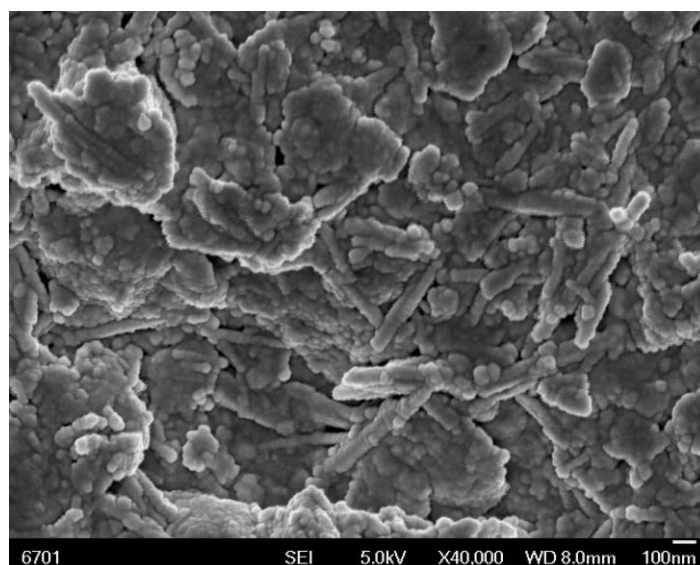


Figure S2. SEM image of PAL.

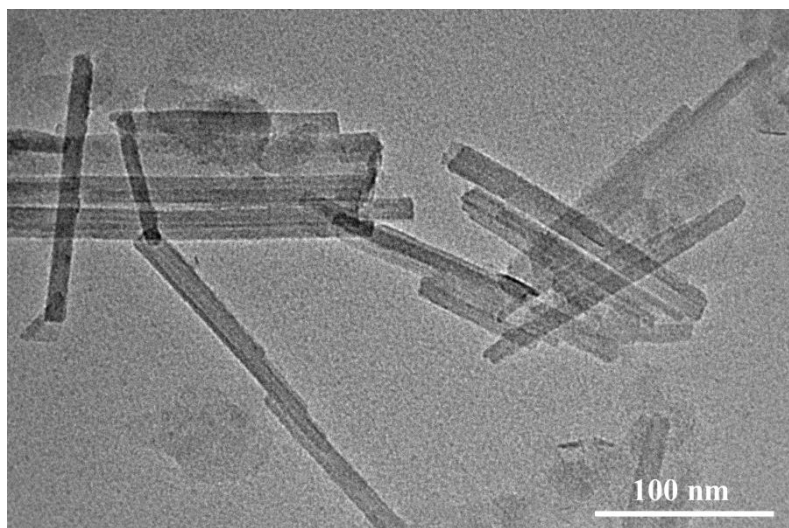


Figure S3. TEM image of PAL.

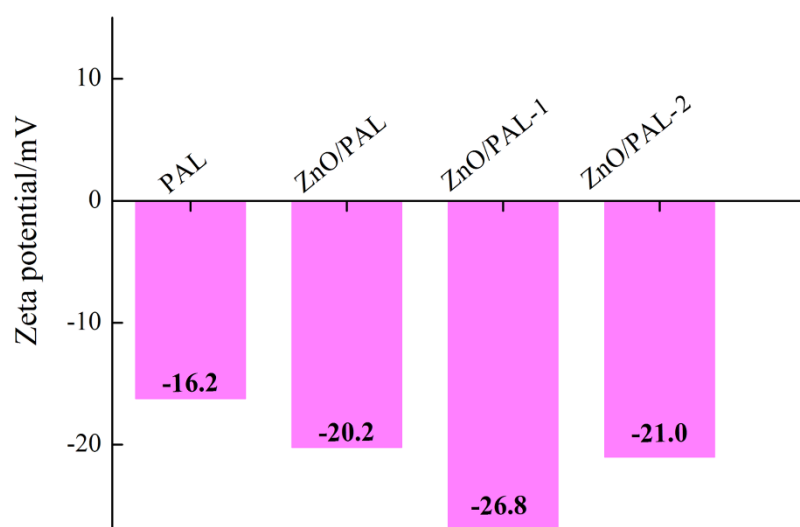


Figure S4. Zeta potential of PAL, ZnO/PAL, ZnO/PAL-1 and ZnO/PAL-2, the pH was 6.3 (aqueous solution).

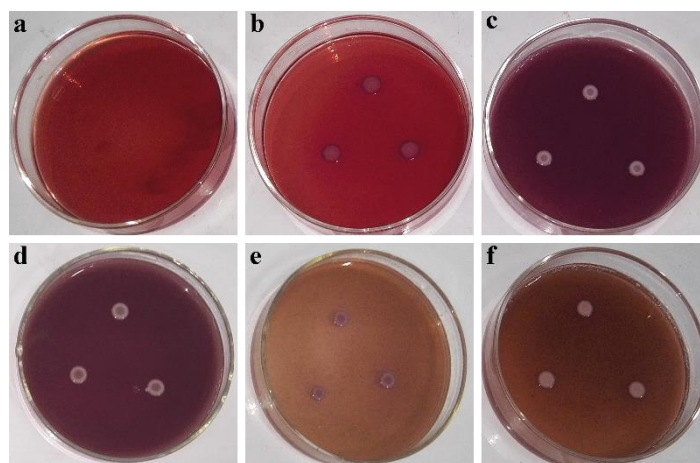


Figure S5. (a) Blank control, (b) positive control of *E. coli*, *E. coli* treated by PAL with various concentrations of (c) 50 mg/mL, (d) 20 mg/mL, (e) 10 mg/mL, (f) 1 mg/mL.

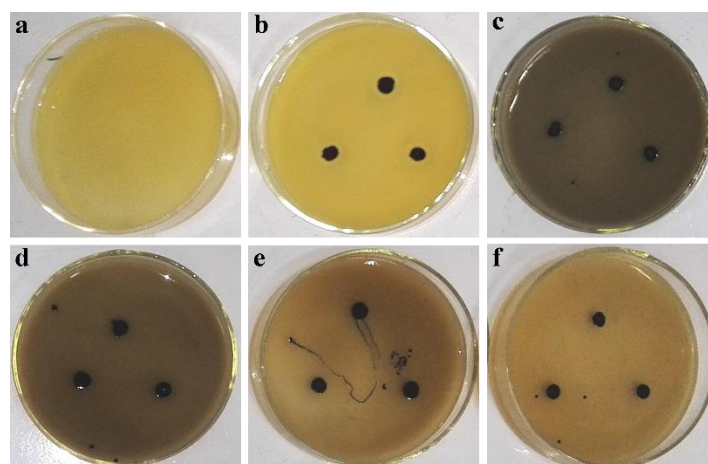


Figure S6. (a) Blank control, (b) positive control of *S. aureus*, *S. aureus* treated by PAL with various concentrations of (c) 50 mg/mL, (d) 20 mg/mL, (e) 10 mg/mL, (f) 1mg/mL.

Preparation of ZnO/PAL Nanocomposites

Natural PAL was crushed and purified by 2% H_2SO_4 solution with a solid/liquid ratio of 1:10 deionized water solution corresponding to PAL mass to remove the associated carbonates, and the purified PAL was filtered by passing through a 200-mesh sieve for further use. ZnO/PAL nanocomposites were fabricated by hydrothermal process. Typically, 15 mM $\text{Zn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ and 2.7 g PAL and 225 mM NaOH were dissolved into 130 mL deionized water. Constant stirring for 30 min, different content (0.25, 0.5, 1.5, 2.0 wt%) of Span 40 and (0.25, 0.5, 1.5, 2.0 wt%) of Tween 20 corresponding to PAL were added into above solution, respectively. The mixture was ultrasonically dispersed for 60 min and then transferred into a 100 mL Teflon-lined stainless-steel autoclave, which was heated to 180 °C and maintained for 180 min. After being cooled to room temperature, the solid powder was collected by centrifugation and dried at 60 °C in an oven.

Table S1. The MIC values of ZnO/PAL nanocomposites prepared by different content of Span 40 against *E. coli* and *S. aureus*.

| Content of Span 40 (%) | MIC (mg/mL) | | | | | | | |
|------------------------|----------------|-----|-----|---|------------------|-----|-----|---|
| | <i>E. coli</i> | | | | <i>S. aureus</i> | | | |
| | 5 | 2.5 | 1.5 | 1 | 5 | 2.5 | 1.5 | 1 |
| 0.25 | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ |
| 0.5 | ✓ | ✓ | ✗ | ✗ | ✓ | ✗ | ✗ | ✗ |
| 1.5 | ✓ | ✗ | ✗ | ✗ | ✓ | ✗ | ✗ | ✗ |
| 2 | ✓ | ✗ | ✗ | ✗ | ✓ | ✗ | ✗ | ✗ |

✓—The sample could inhibit completely the growth of each bacterial strain

✗—The sample could not inhibit completely the growth of each bacterial strain

Table S2. The MIC values of ZnO/PAL nanocomposites prepared by different content of Tween 20 against *E. coli* and *S. aureus*.

| Content of Tween 20 (%) | MIC (mg/mL) | | | | | | | |
|-------------------------|----------------|-----|-----|---|------------------|-----|-----|---|
| | <i>E. coli</i> | | | | <i>S. aureus</i> | | | |
| | 5 | 2.5 | 1.5 | 1 | 5 | 2.5 | 1.5 | 1 |
| 0.25 | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ |
| 0.5 | ✓ | ✓ | ✗ | ✗ | ✓ | ✗ | ✗ | ✗ |
| 1.5 | ✓ | ✓ | ✗ | ✗ | ✓ | ✗ | ✗ | ✗ |
| 2 | ✓ | ✓ | ✗ | ✗ | ✓ | ✗ | ✗ | ✗ |

✓—The sample could inhibit completely the growth of each bacterial strain.

✗—The sample could not inhibit completely the growth of each bacterial strain.

Table S3. The ZnO loading of ZnO/PAL-1 and ZnO/PAL-2 determined by AAS.

| Samples | Zn Content (%) | ZnO loading content (%) |
|-----------|----------------|-------------------------|
| ZnO/PAL-1 | 32.98 | 41.09 |
| ZnO/PAL-2 | 32.75 | 40.81 |