Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

ZnO nanoparticles decorated two-dimensional titanium carbide

with enhanced supercapacitive performance

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Supplementary methods:

1. Synthesis of Ti_3AlC_2

Ball milling TiC, Ti, Al powders in a molar ratio of 1:1:1.2 in ethanol for 4 h and dried at 50 ^{o}C for 48 h. The mixture was sintered in 1350 ^{o}C for 2 h with the vacuum pressless sintering method. The sintered product was high-energy ball milled in ethanol for 2 h, and then sifted out through a sieve (200 meshes) and dried at 50 ^{o}C for 24 h.

2. Synthesis of Ti_3C_2

Put 5 g as-synthesized Ti_3AlC_2 powder in 80 ml of 40% HF solution at room temperature for 24 h. Then the resulting suspension was washed using deionized water until the pH value reached around 5 and centrifuged to separate the powders. Finally the left powder was dried at 40^{o}C for 24 h.

Figure Captions:

Fig. S1. XRD patterns of Ti_3AlC_2 and Ti_3C_2.

Fig. S2. XRD patterns of ZnO.

Fig. S3. SEM image of Ti_3AlC_2.

Fig. S4. SEM image of ZnO.

Fig. S5. Digital photographs of the thin film produced by rolling (a), the flexibility of the film is demonstrated (b), SEM images of fracture surface of the thin film (~ 20 μm) (c-d).

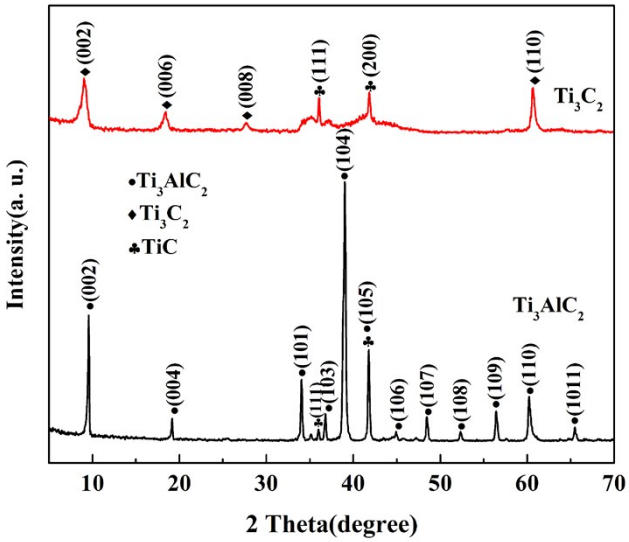

Fig. S1. XRD patterns of Ti_3AlC_2 and Ti_3C_2.

It is clear that the (101) peaks of Ti_3AlC_2, such as (103), (104), (105), (106), (107), (108) and (109), disappeared, indicating the "Al" layer was etched out from the ternary layered structure. The (002) peak broadened and shifted to a lower angle, suggesting a lower crystallinity of Ti_3C_2.

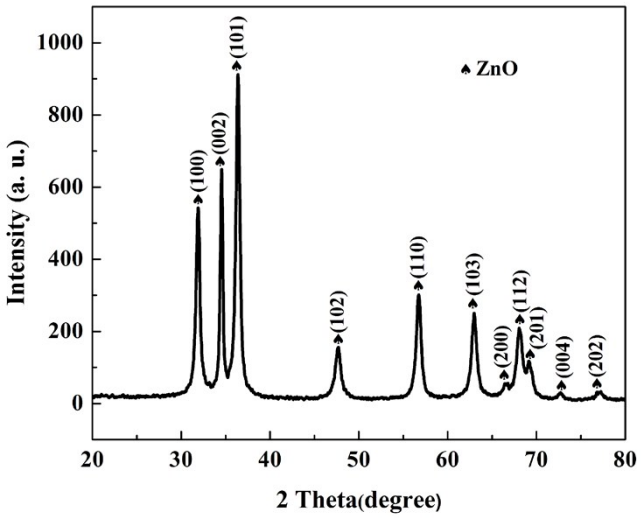

Fig. S2. XRD patterns of ZnO.

All of the diffraction peaks observed agree well with the hexagonal wurtzite ZnO (JCPDS36-1451).

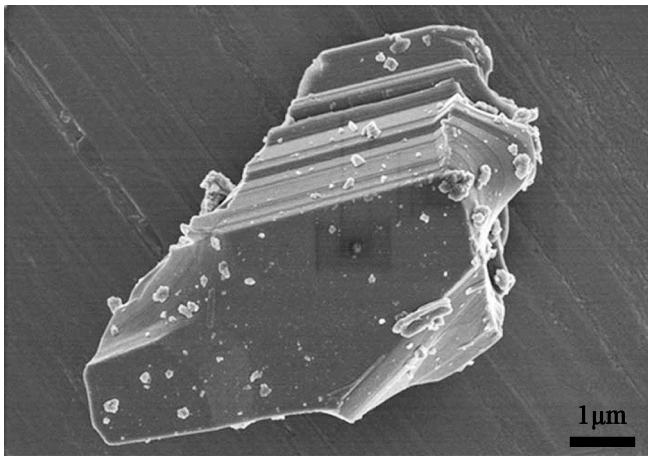

Fig. S3. SEM image of Ti_3AlC_2.

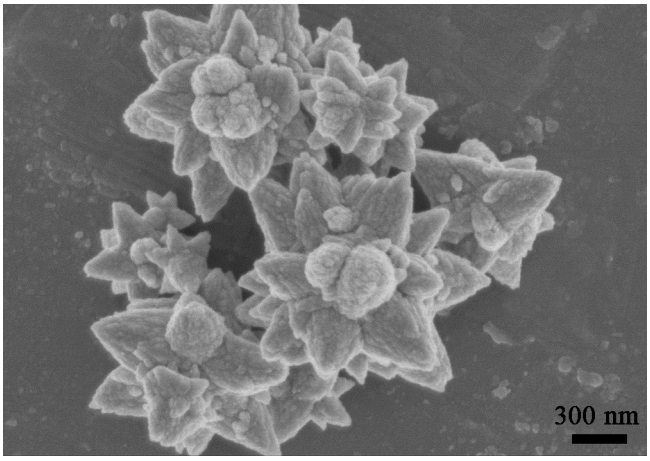

Fig. S4. SEM image of ZnO.

It can be clearly seen that the ZnO nanoparticles aggregated and formed flower-shaped architecture, implying that the existence of Ti_3C_2 sheets can prevent the aggregation of ZnO nanoparticles effectively.

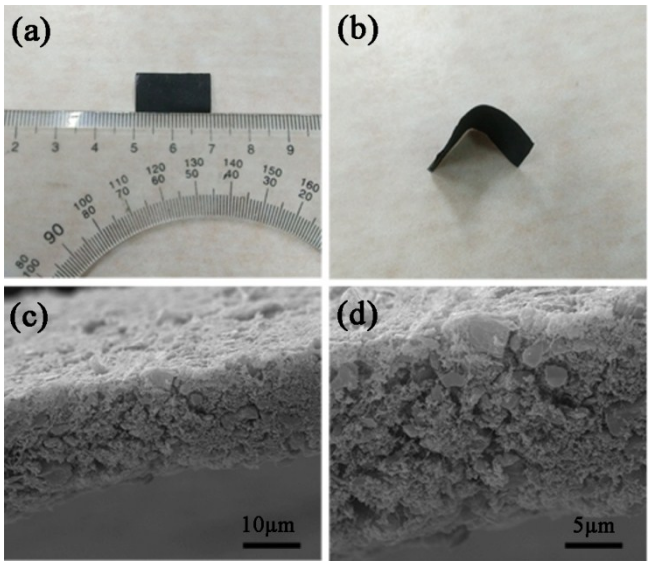

Fig. S5. Digital photographs of the thin film produced by rolling (a), the flexibility of the film is demonstrated (b), SEM images of a fracture surface of the thin film (~ 20 μm) (c-d).