Supporting Information

Ultra-thin SiC Layers Covered Graphene Sheets as Advanced Photocatalysts for Hydrogen Evolution

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As shown in Fig. S1, the pristine graphene sheets (GSs, specific surface area of more than 90 $m^2.g^{-1}$), which were purchased from Nanjing XFNANO Materials Tech Co., Ltd., have the thickness of 1-5 nm and should be made up of 3-15 stacking layers of the monatomic graphene. These pristine GSs are flexible, clean and have a sheet-stacked structure with smooth surfaces and several stacking layers of the monatomic graphene sheets.

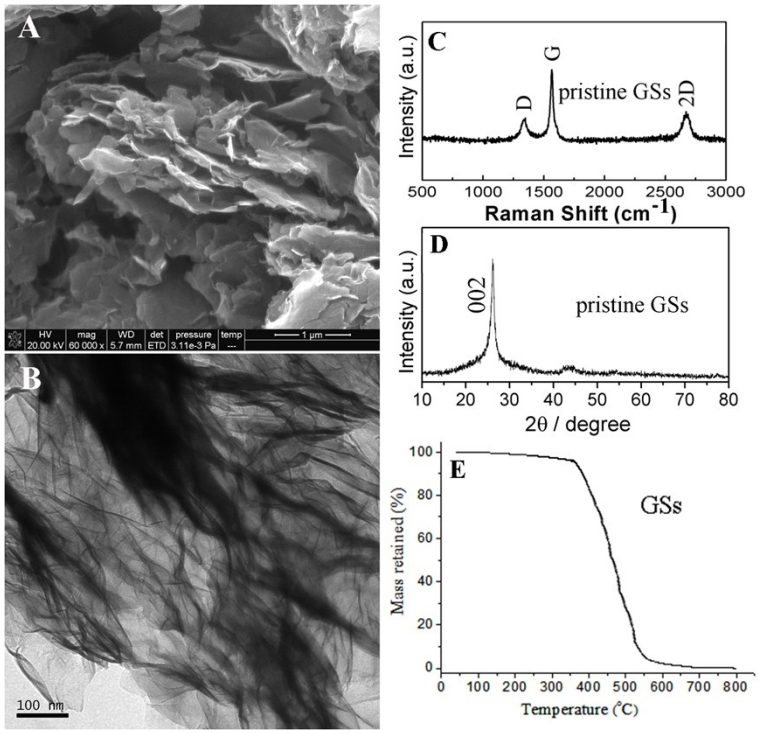

Fig. S1. SEM (A) and TEM (B) images, Raman spectrum (C), XRD pattern (D) and TGA (E) of the pristine GSs.

Preparation of the SiC NCs for comparison:

The SiC NCs were prepared through heating the GSs and silicon powder in an argon atmosphere at 1320 °C for 1h and keeping the other parameters constant for the SiC/GS hybrids. Then, the obtained products were heated at 550 °C in air for 1h.

As shown in Fig. S2, the SiC NCs (BET surface area: 32.5 m^2 g^{-1}) of nanocrystals (A) was observed when the reaction was carried out at 1320 °C for 1 h and after heating at 550 °C in air for 1h. The XRD pattern (B) provides clear evidence that the products are composed of a solid phase, namely SiC (JCPDS card No 29-1129).

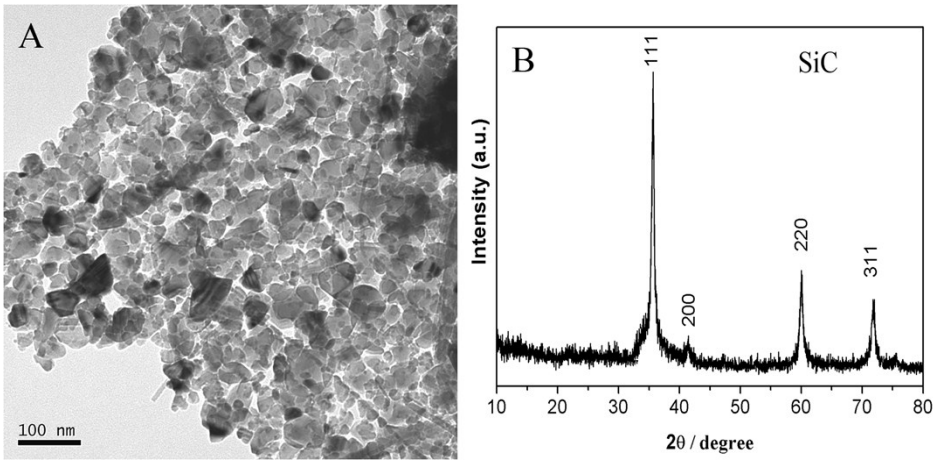

Fig. S2. TEM (A) and XRD pattern (B) of the SiC NCs

An abrupt mass loss of the GSs occurs between 350 °C and 550 °C, indicating the oxidation and decomposition of graphene in air (see Fig.S1). However, for the SiC/GSs and GSs@SiC (see Fig.S3), the mass loss occurs between 550 °C and 800 °C, suggesting that the superior intrinsic contact between SiC and GSs could greatly enhance their thermal stability. A thin continuous SiC layer must cover nearly the whole surface of GSs in the SiC/GSs sample so that the GS oxidation was elevated to above 550 °C. The mass fraction of the SiC in the two samples can be easily estimated to be about 22.92 wt% for the SiC/GSs and 44.94 wt% for the GSs@SiC,

respectively.

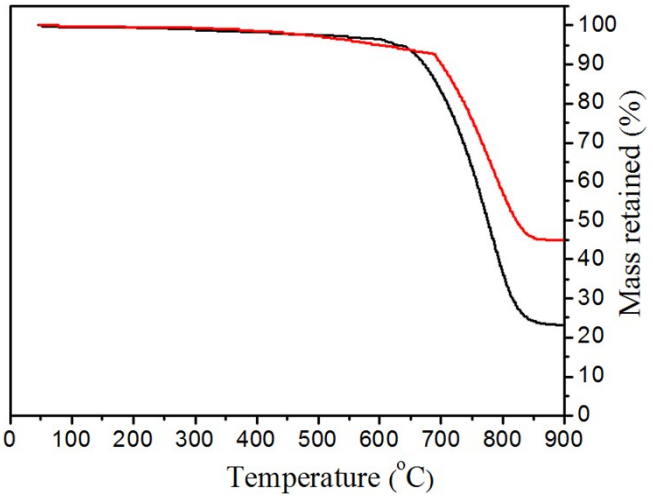

Fig. S3. TGA curves of the SiC/GSs and GSs@SiC.

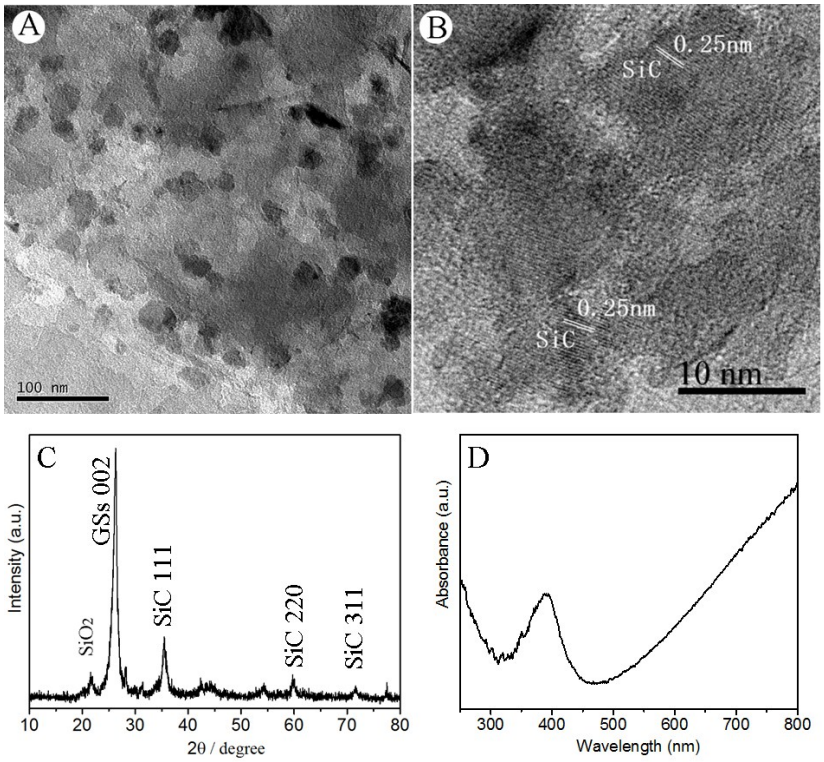

Fig.S4. TEM (A), HRTEM (B) images, XRD patterns (C) and UV-Vis spectra of the SiC/GSs after four noncontinuous cyclic experiments.