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A Facile Chemical Exfoliation Method to Obtain Large Size Boron Nitride Nanosheets

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Supporting Information

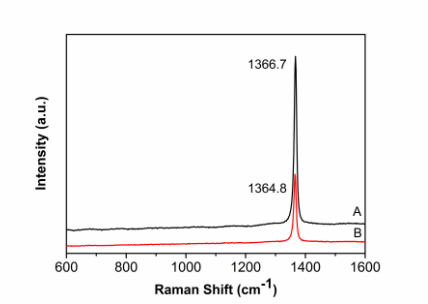

Fig. S1 Raman spectra of BN powder (A) and BNNSs (B)

Figure S1 shows the typical Raman spectra of BNNSs and BN powder, where intense peak of the BNNSs appears at 1364.8 cm^{-1}, attributed to the E_{2g} vibration mode of h-BN.[1] The intense peak of BN powder appears at 1366.7 cm^{-1}. The full width at half-maximun (FWHM) of the E_{2g} mode is about 5.08 cm^{-1} for the present BNNSs, which is larger than that of the BN powder (4.77 cm^{-1}). A redshift and broadening of the E_{2g} vibration mode are typical for the h-BN thickness decreasing.[2] In addition, the intensity of the E_{2g} vibration mode of BNNSs decreases obviously, which may be attributed to the weakening interaction between layers during the exfoliation process of BN powder. All these results show that the BN powder was exfoliated into BNNSs by this facile chemical method, which is consistent with the results of XRD and FTIR.

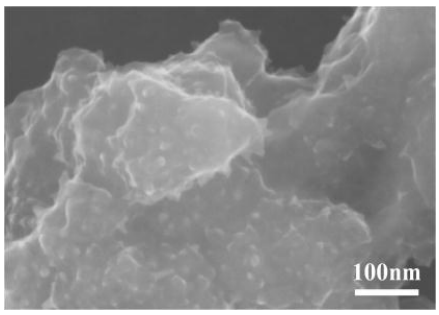

Fig. S2 SEM image of the intermediate products before adding H_2O_2

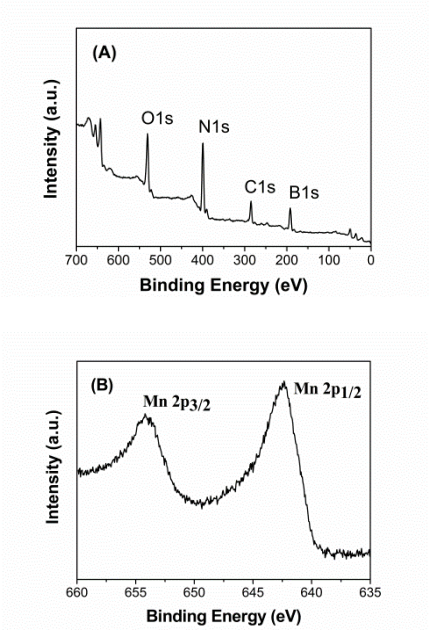

Fig. S3 XPS spectrum of the intermediate products before adding H_2O_2: (A) XPS survey spectra of the intermediate products. (B) Mn2p XPS scans of the intermediate products.

In order to prove the exfoliation mechanism, the intermediate products before adding H_2O_2 in this experiment were investigated by means of SEM and XPS. Figure S2 shows the SEM image of the intermediate samples. It can be seen that the BNNSs were exfoliated and some nanoparticles with diameters of 10-20 nm deposited on the BNNSs surface, which prevented the re-stacking of BNNSs due to van der Waals interactions. For this reason, we infer that the generated nanoparticles and their growth are of great benefit to further exfoliating BN and acquiring large size BNNSs. In order to further investigate the composition of nanoparticles, XPS spectrum (Figure S3) was recorded. Figure S3 shows two peaks at 642.25 and 653.85 eV, assignable to Mn $2p_{3/2}$ and Mn $2p_{1/2}$ for MnO_2, respectively. [3] Hence, the XPS results confirm the nanoparticles deposited on BNNSs are MnO_2 nanoparticles. Based on SEM and XPS results, we think that MnO_2 nanoparticles play a very important role in exfoliating BN, and this proved the previously-mentioned exfoliation mechanism feasible.

REFERENCES

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(2) Nemanich, R. J.; Solin, S. A.; Martin, R. M. *Phys. ReV. B.* 1981, 23, 6348-6356.

(3) Wang L.; Sakai N.; Ebina Y.; Takada K.; Sasaki T. *Chem. Mater.* 2005, 17, 1352-1357.