Supporting information for:

Ti_3C_2 Nanosheets with Broad-Spectrum Antioxidant Activity for Cytoprotection against Oxidative Stress

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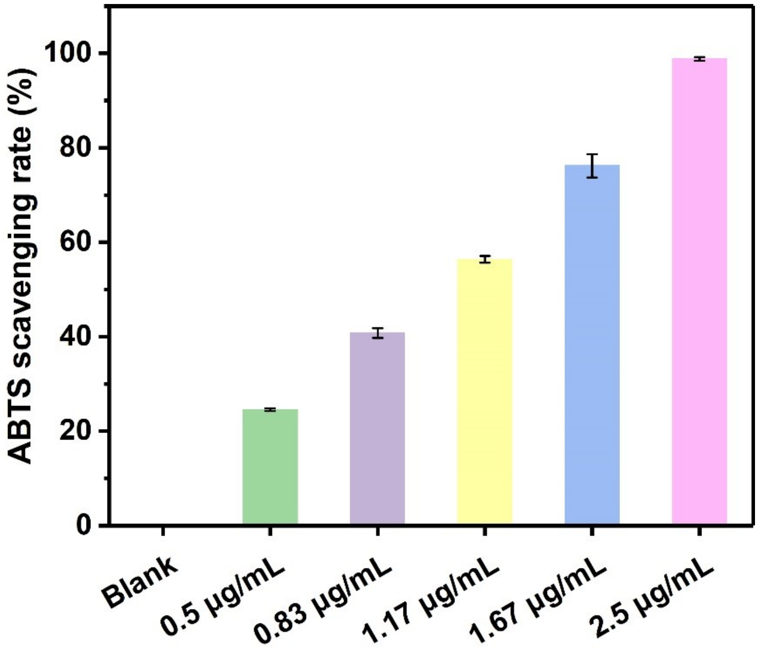


Fig. S1 Histogram of ABTS$^{+•}$ radical scavenging rate by Ti_3C_2 at different concentrations.

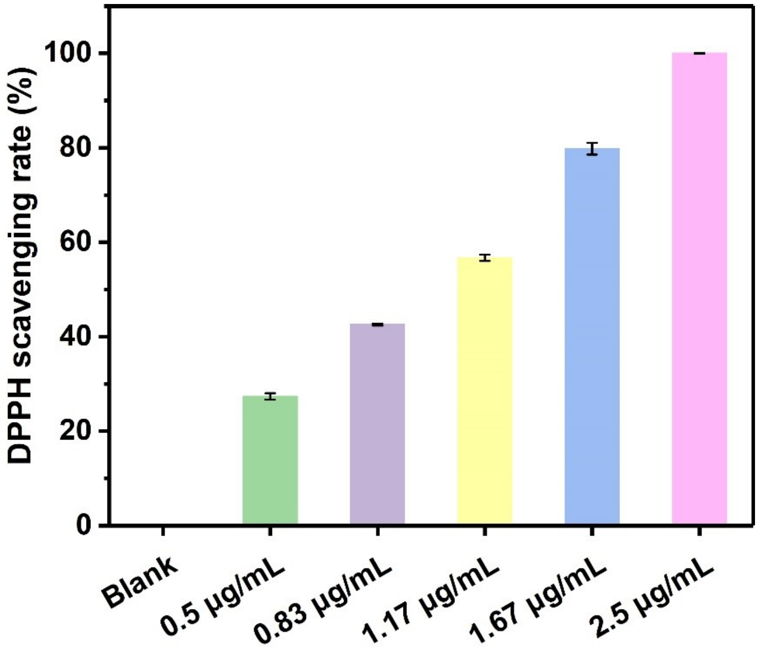


Fig. S2 Histogram of DPPH• radical scavenging rate by Ti_3C_2 at different concentrations.

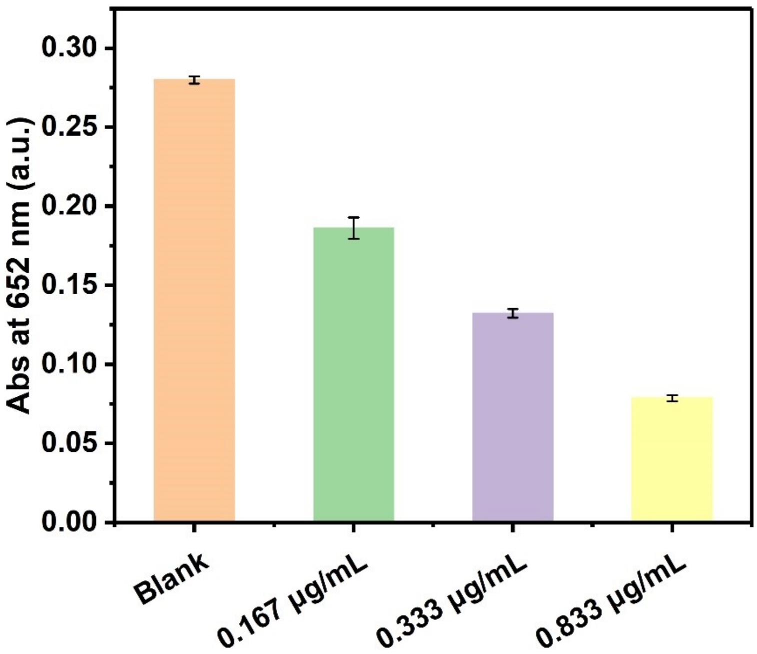


Fig. S3 The concentration dependence of •OH scavenging activity of Ti_3C_2.

The hydroxyl radicals are generated by light irradiating TiO_2 NPs and then oxidize TMB to produce typical blue color. The addition of Ti3C2 can significantly inhibit the oxidation of TMB in a concentration dependent manner, suggesting again their •OH scavenging activity.

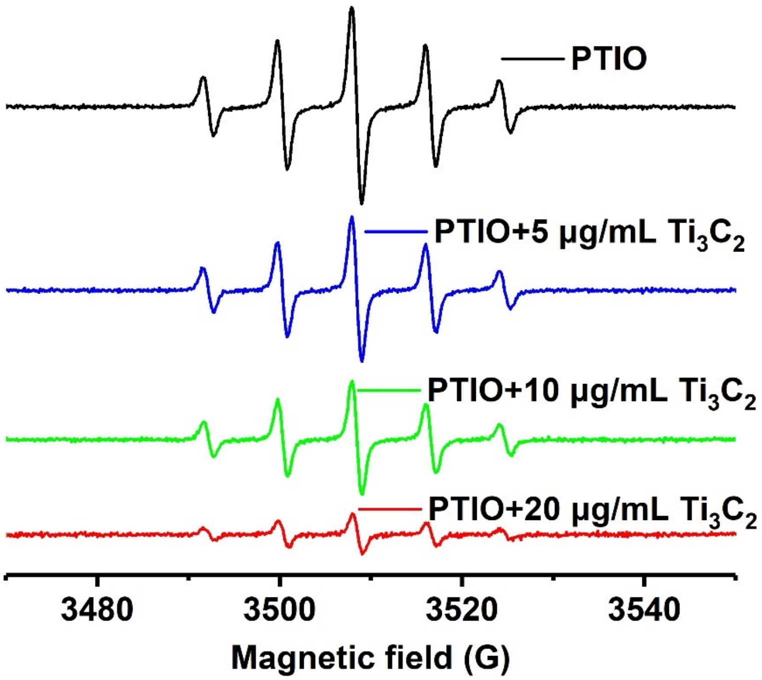


Fig. S4 Scavenging PTIO• radicals activity of Ti_3C_2 dependent on the concentrations.

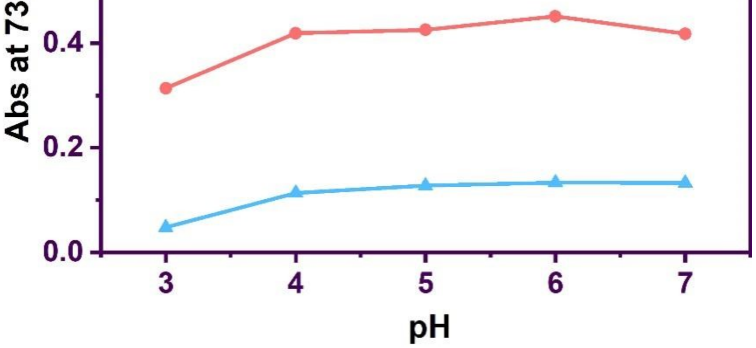


Fig. S5 Histogram of $ABTS^{+\bullet}$ radical scavenging activity of Ti_3C_2 and Ti_3C_2-PEG under different pH conditions.

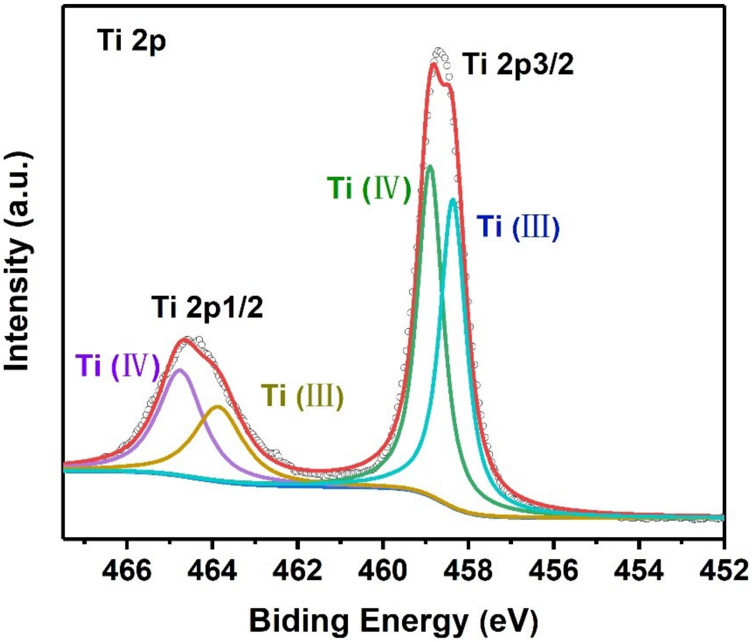


Fig. S6 High resolution XPS spectra of Ti 2p from Ti_3C_2-B.

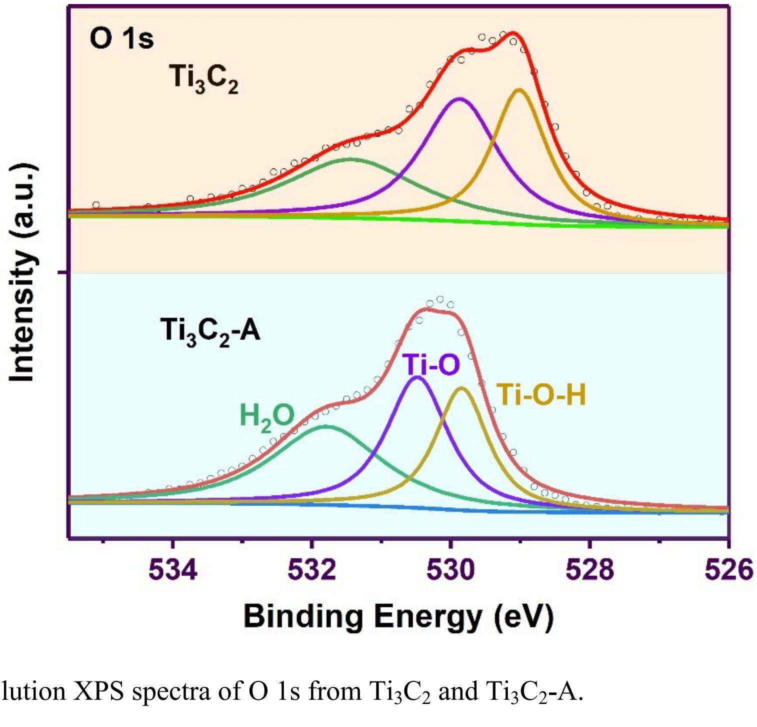


Fig. S7 High resolution XPS spectra of O 1s from Ti_3C_2 and Ti_3C_2-A.

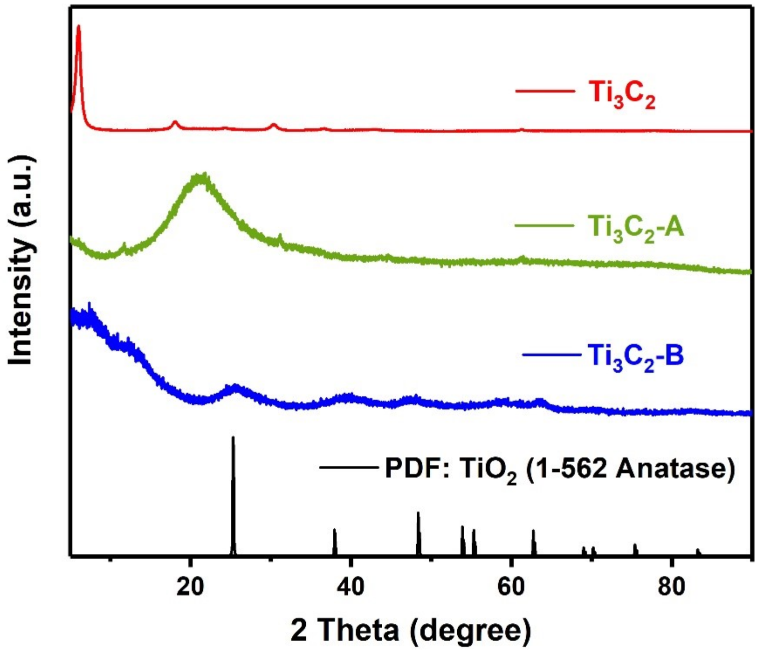


Fig S8. XRD patterns of Ti_3C_2, Ti_3C_2-A and Ti_3C_2-B nanosheets.

It can be seen from XRD that Ti_3C_2 has good crystallinity. The characteristic peak (002) at 6.4° disappeared after oxidation with either $ABTS^{+\bullet}$or H_2O_2. The obvious change of XRD patterns indicate the crystal structure change in Ti_3C_2 after oxidation. For the Ti_3C_2 after oxidation of H_2O_2 (Ti_3C_2-B), the characteristic peaks corresponding to anatase appeared, reflecting the formation of TiO_2 particles.

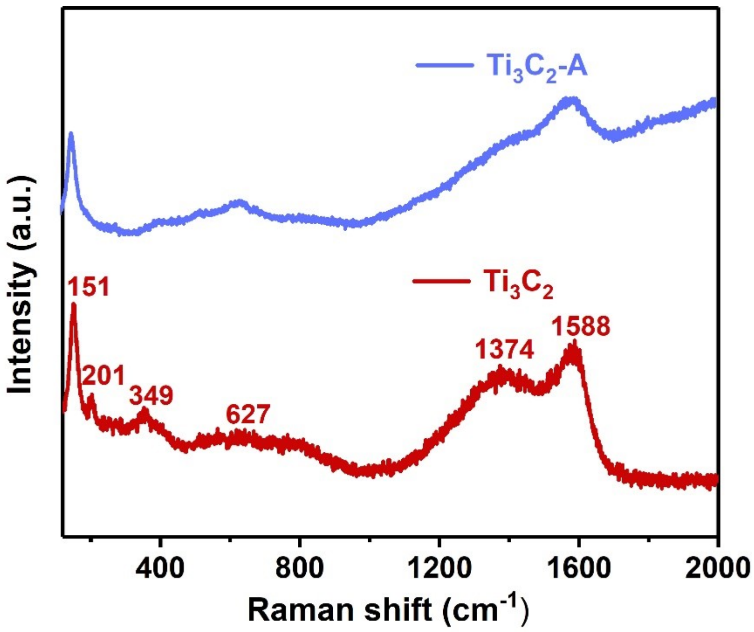
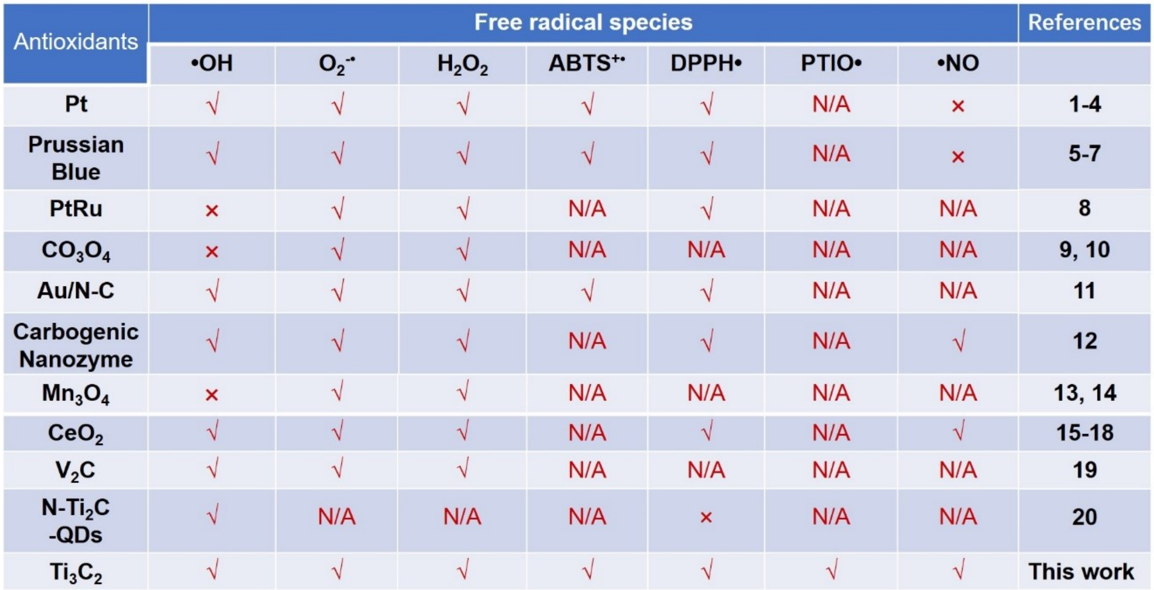


Fig. S9 Raman spectra of Ti_3C_2 and Ti_3C_2-A.

The changes of Ti_3C_2 and Ti_3C_2-A were also validated by Raman spectra (Figure S9). The typical peaks at 151, 201, 349 and 627 cm^{-1} can be distinguished to the vibrational modes: Eg of $Ti_3C_2F_2$, Eg of $Ti_3C_2(OH)_2$, Eg of $Ti_3C_2O_2$ and the vibrational modes of nonstoichiometric titanium carbide, respectively.[21, 22] Theses indicate the existence of groups -F, -O and -OH. The in-phase vibration of the graphene (G band) at 1588 cm^{-1} as well as the disorder band caused by the graphene edges (D band) at approximately 1374 cm^{-1} are clearly exhibited in Ti_3C_2.[23] After oxidation with free radicals, the G-band disappeared, which was suspected to be due to the change of the layered hexagonal structure of Ti_3C_2.

Table S1 Comparison of antioxidant nanomaterials for their antioxidant capability.



Antioxidants	Free radical species							References
	•OH	$O_2^{\bullet-}$	H_2O_2	$ABTS^{\bullet+}$	DPPH•	PTIO•	•NO	
Pt	√	√	√	√	√	N/A	×	1-4
Prussian Blue	√	√	√	√	√	N/A	×	5-7
PtRu	×	√	√	N/A	√	N/A	N/A	8
CO_3O_4	×	√	√	N/A	N/A	N/A	N/A	9, 10
Au/N-C	√	√	√	√	√	N/A	N/A	11
Carbogenic Nanozyme	√	√	√	N/A	√	N/A	√	12
Mn_3O_4	×	√	√	N/A	N/A	N/A	N/A	13, 14
CeO_2	√	√	√	N/A	√	N/A	√	15-18
V_2C	√	√	√	N/A	N/A	N/A	N/A	19
N-Ti_2C -QDs	√	N/A	N/A	N/A	×	N/A	N/A	20
Ti_3C_2	√	√	√	√	√	√	√	This work

Table S2 Comparison of DPPH free radical scavenging ability of Ti_3C_2 with reported antioxidant.

Antioxidants	**DPPH radical dosage**	**Antioxidants content (μg/mL)**	**Reaction time (min)**	**Scavenging efficiency (%)**	**References**
cationic heteroleptic Pd(II) complex (3)	1 mL (0.073 mg/mL)	75	30	76%	24
(Z)-tributylstannyl 4-(4-methoxyphenylamino)-4-oxobut-2-enoate (2)	180 μl 0.032 mg/mL	N/A	60	55%	25
epigallocatechin gallate@TiO_2	9.9 mL (25 mg/mL)	8.5	N/A	80%	26
TiO_2 NPs	1 mL (0.394 mg/mL)	100	30	85%	27
Ti_3C_2 NSs	2.5 mL (0.1 mg/mL)	2.5	2	100%	This work

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