Electronic Supplementary Material (ESI) for Nanoscale.

Porphyrin-Based Metal-Organic Frameworks: Hydrogen Protonation Induced Q band Absorption

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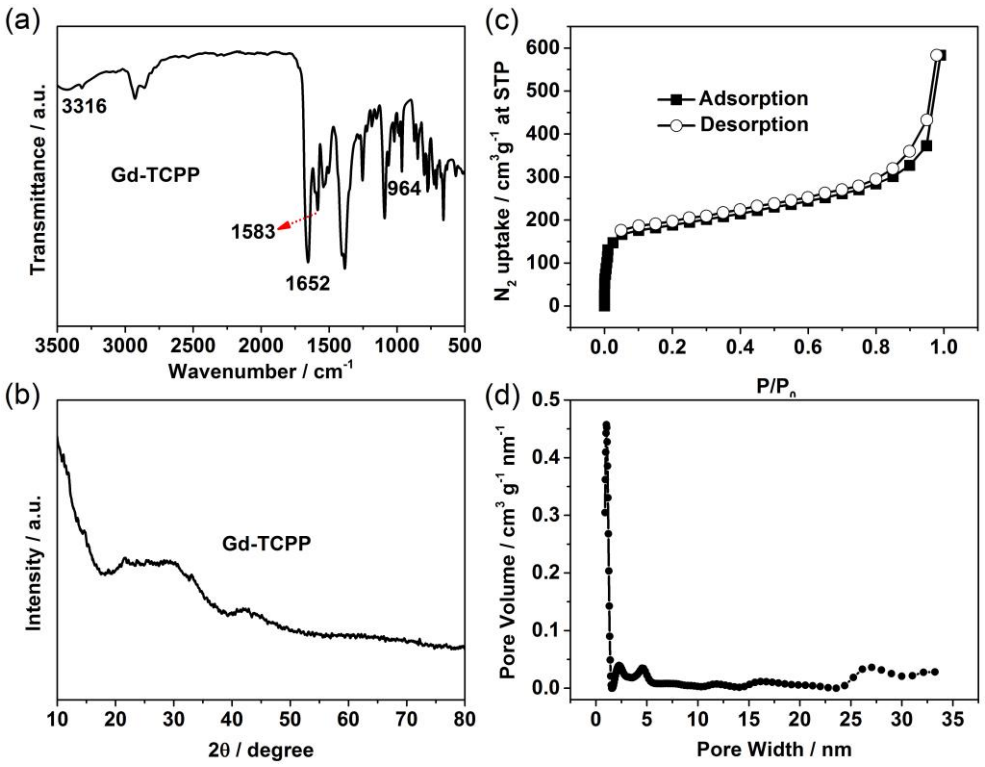

Figure S1. (a) FT-IR, (b) XRD, (c) N_2 adsorption-desorption isotherms, and (d) pore size distribution of the prepared Gd-TCPP MOFs nanosheets. The Gd-TCPP shows an approximate type I Langmuir isotherms with a Brunauer-Emmett-Teller surface area of 646.4 m^2 g^{-1}.

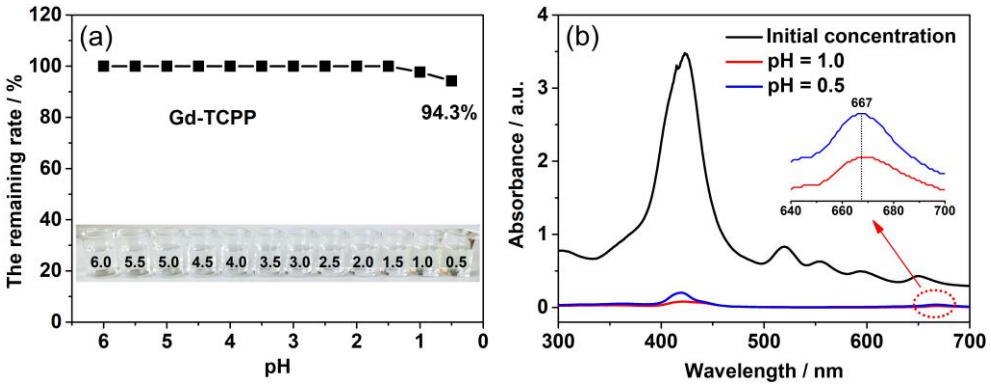

Figure S2. (a) Remaining rate of Gd-TCPP MOFs nanosheets obtained by hydrochloric acid treatment and centrifugation with the different pH. Inset is the photograph of supernatants obtained after hydrochloric acid treatment and centrifugation. (b) UV-vis absorption of the initial concentration of Gd-TCPP MOFs nanosheets, and UV-vis absorption of the residues in the solution after hydrochloric acid treatment and centrifugation at pH=0.5, 1.

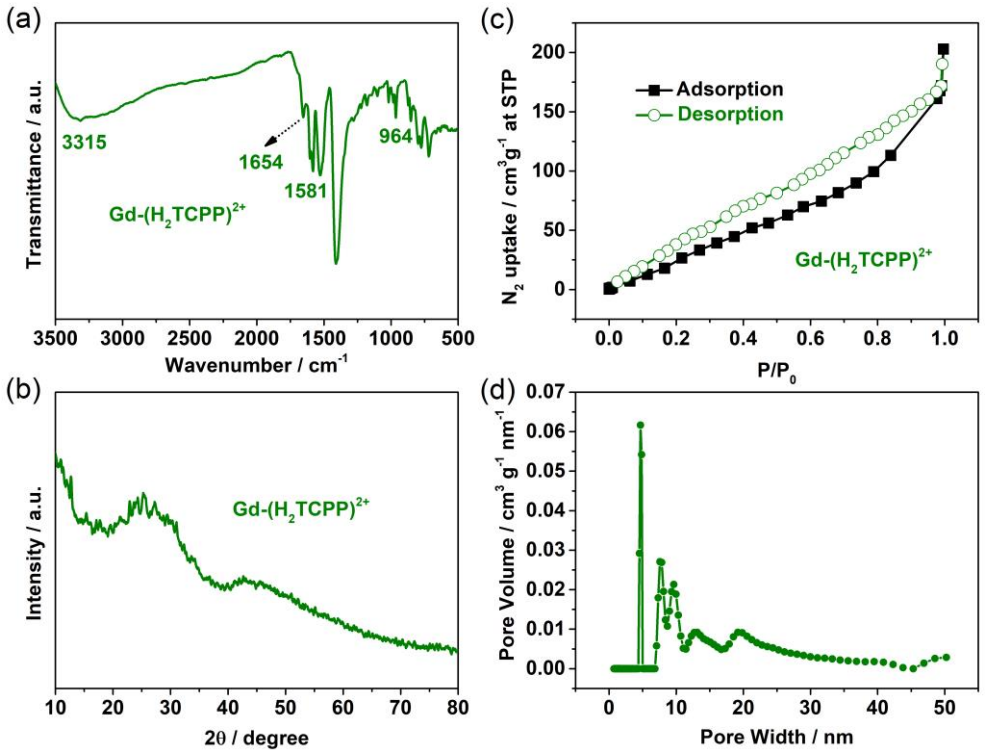

Figure S3. (a) FT-IR, (b) XRD, (c) N_2 adsorption-desorption isotherms, and (d) pore size distribution of the Gd-$(H_2TCPP)^{2+}$. The Gd-$(H_2TCPP)^{2+}$ showed an approximate type II Langmuir isotherms with a Brunauer-Emmett-Teller (BET) surface area of 169.96 m^2 g^{-1}.

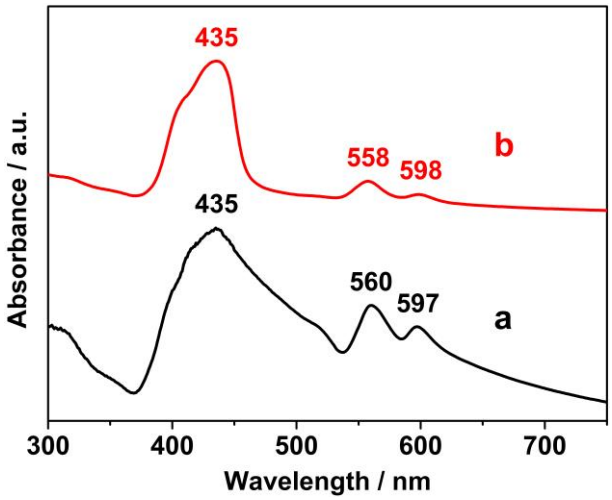

Figure S4. UV-vis absorption of (a) Zn-TCPP MOFs nanosheets and (b) acid-treated Zn-TCPP MOFs nanosheets.

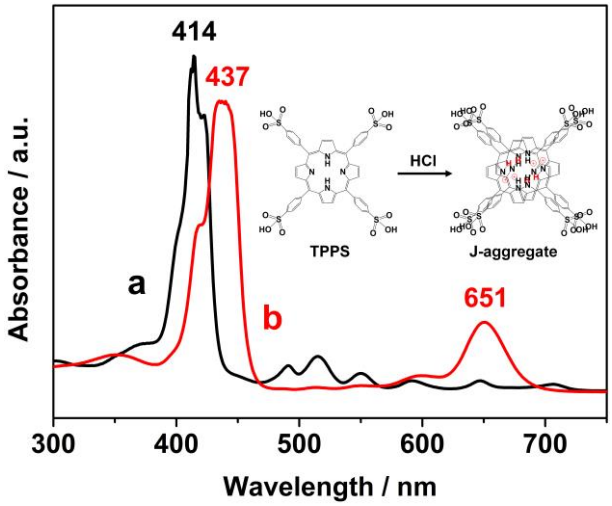

Figure S5. UV-vis absorption of (a) TPPS and (b) acid-treated TPPS.

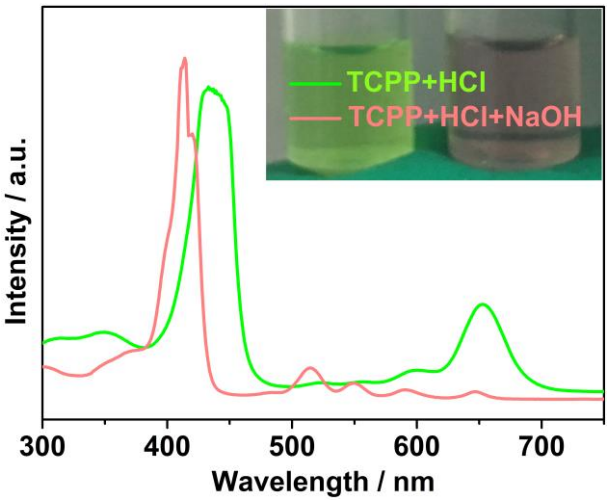

Figure S6. UV-vis absorption and photograph of the acid-treated and recovered TCPP.

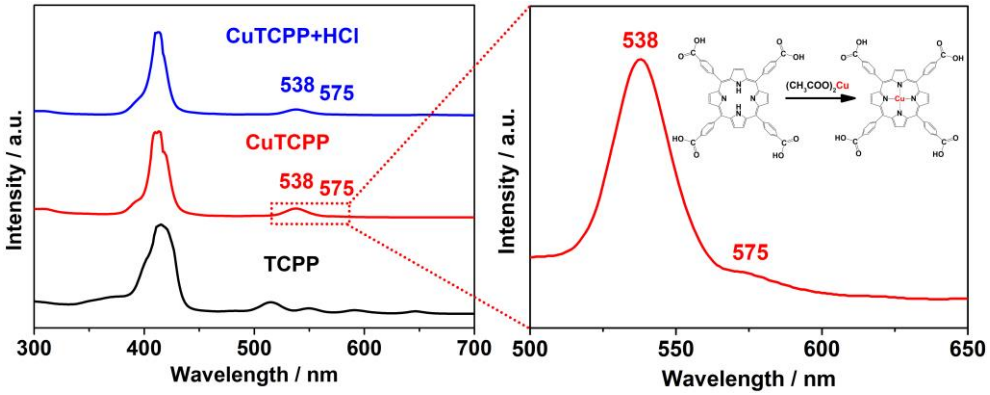

Figure S7. UV-vis absorption of TCPP, CuTCPP, and acid-treated CuTCPP (pH=1.0).

The CuTCPP was prepared by reacting TCPP with copper acetate.

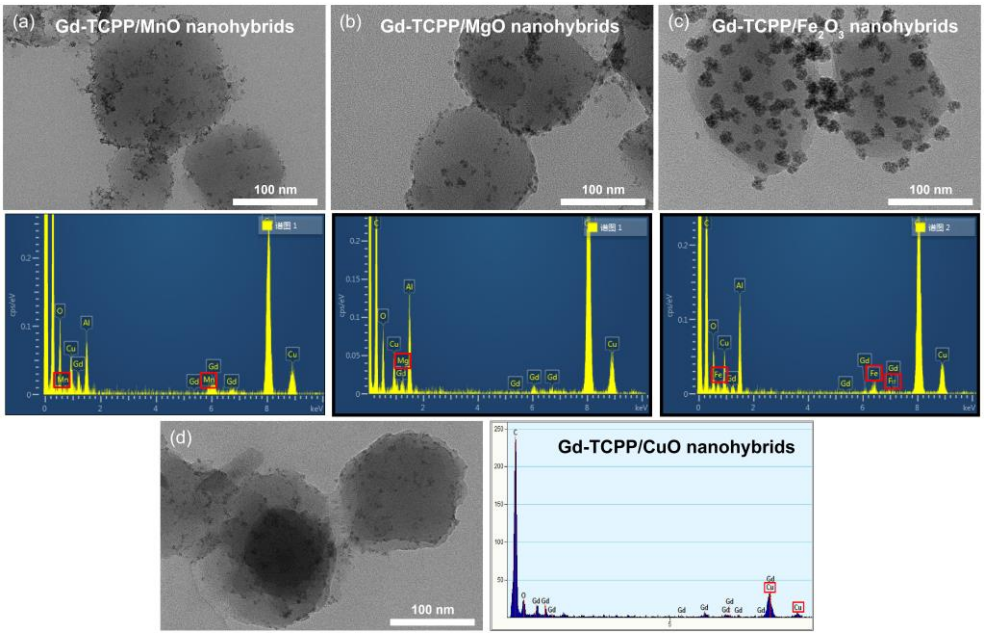

Figure S8. TEM and EDS images of (a) Gd-TCPP/MnO, (b) Gd-TCPP/MgO, (c) Gd-TCPP/Fe_2O_3, and (d) Gd-TCPP/CuO nanohybrids.

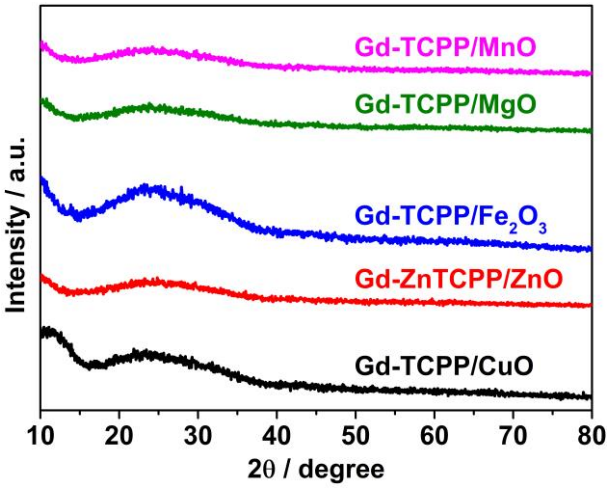

Figure S9. XRD patterns of the Gd-TCPP/MnO, Gd-TCPP/MgO, Gd-TCPP/Fe_2O_3, Gd-ZnTCPP/ZnO, and Gd-TCPP/CuO nanohybrids.

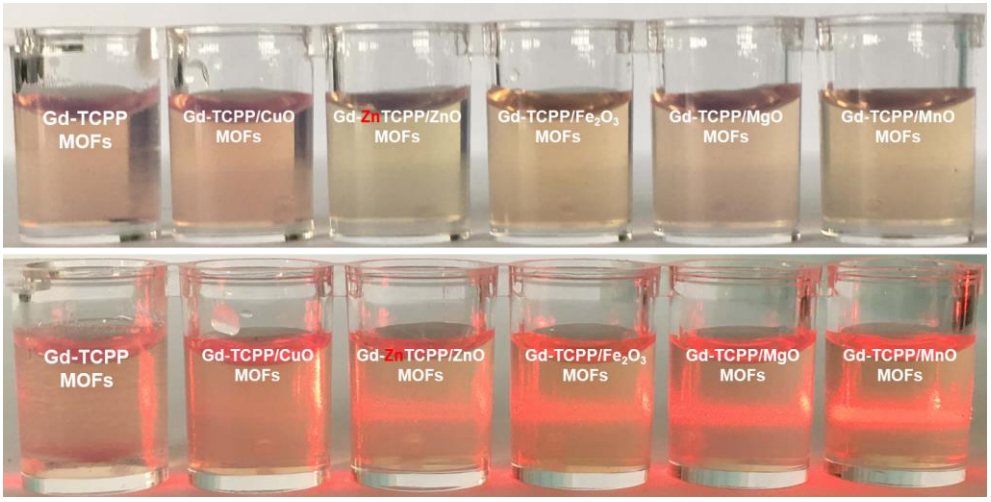

Figure S10. Tyndall effect has been observed for the Gd-TCPP, Gd-TCPP/CuO, Gd-ZnTCPP/ZnO, Gd-TCPP/Fe_2O_3, Gd-TCPP/MgO, and Gd-TCPP/MnO nanohybrids.

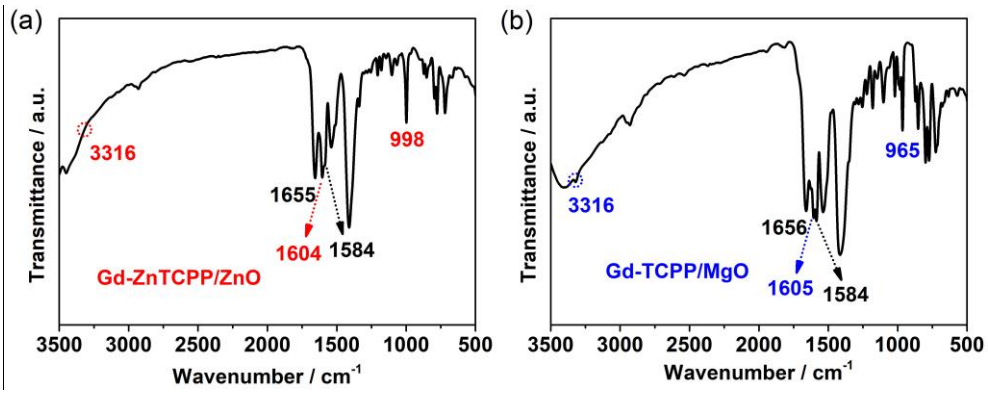

Figure S11. FT-IR of the (a) Gd-ZnTCPP/ZnO and (b) Gd-TCPP/MgO nanohybrids.

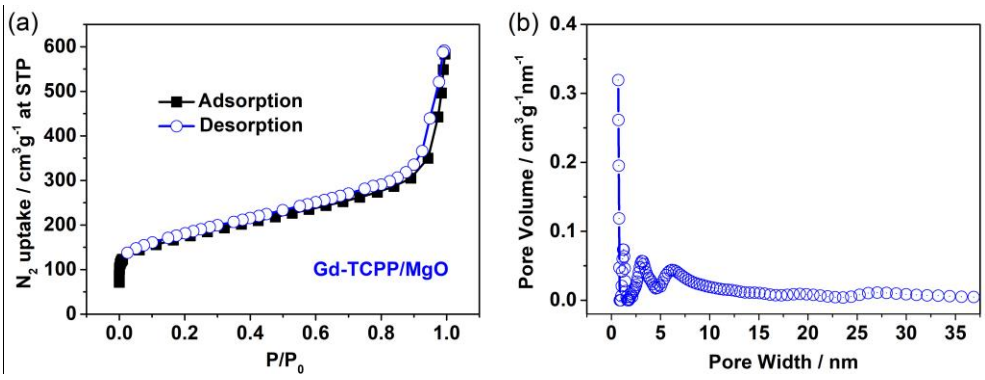

Figure S12. (a) N_2 adsorption-desorption isotherms and (b) pore size distribution of the Gd-TCPP/MgO nanohybrids. The Gd-TCPP/MgO shows an approximate type I Langmuir isotherms with a Brunauer-Emmett-Teller surface area of 608.6 m^2 g^{-1}.

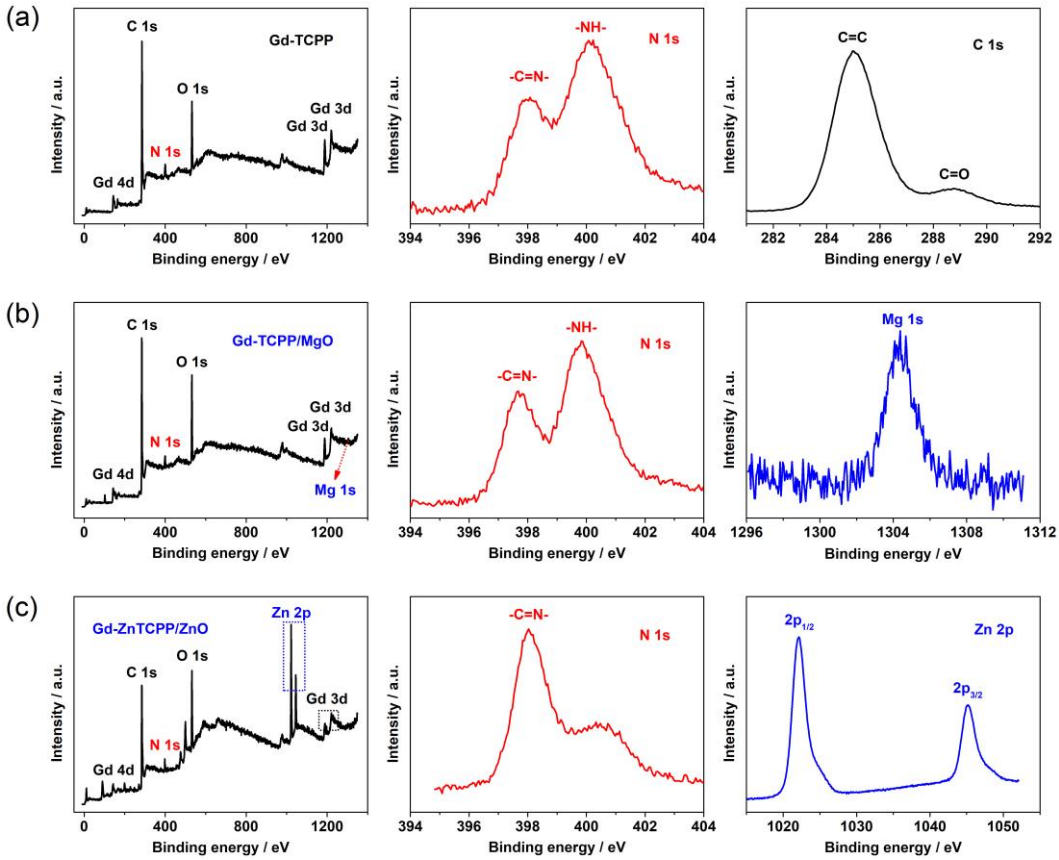

Figure S13. (a) Full XPS spectrum, N 1s spectrum, and C 1s spectrum of the Gd-TCPP nanosheets. (b) Full XPS spectrum, N 1s spectrum, and Mg 1s spectrum of the Gd-TCPP/MgO nanohybrids. (c) Full XPS spectrum, N 1s spectrum, and Zn 2p spectrum of the Gd-ZnTCPP/ZnO nanohybrids.

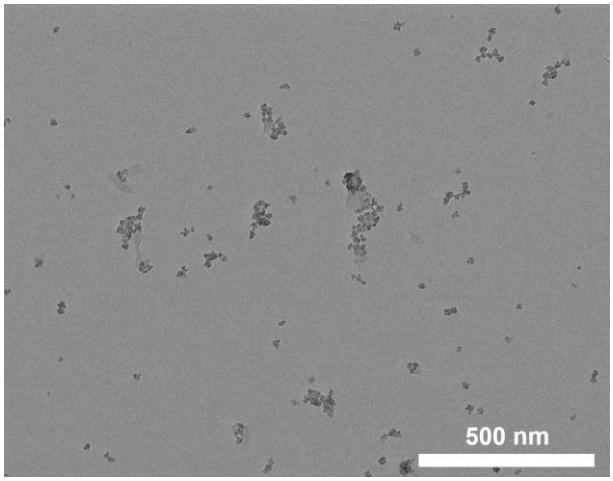

Figure S14. TEM image of the acid-treated Gd-TCPP/Fe_2O_3 nanohybrids.

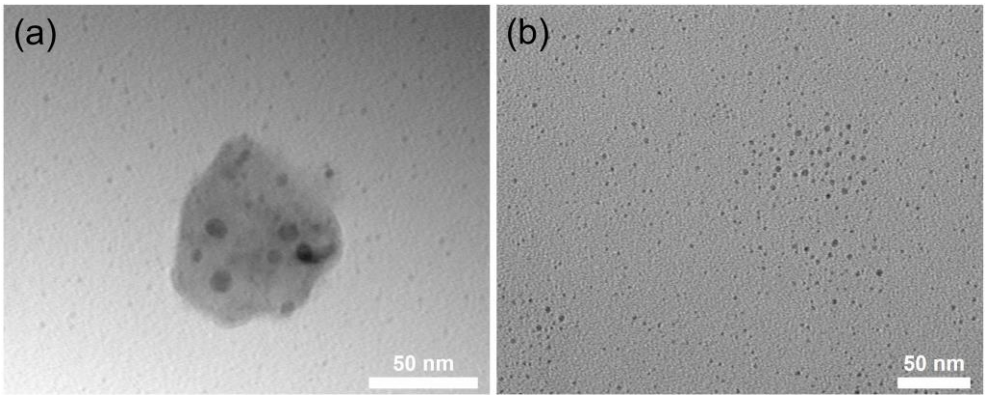

Figure S15. TEM images of the acid-treated Gd-ZnTCPP/ZnO nanohybrids.

MOFs	Porphyrin	Porphyrin core	S_{BET} (m^2 g^{-1})	Q-band number	Ref
COF-366-Co	Co(TAP)	Co	1360	2	S1
Co-TCPP(Fe)	TCPP(Fe)	Fe	-	2	S2
M-UiO	H_2DBP-Pt	Pt	-	2	S3
Zn-TCPP(BP)	TCPP	Zn	483	2	S4
$\{CuL\text{-}[AlOH]_2\}_n$	H_6L	Cu	-	2	S5
Ru-TBP-Zn	H_4TBP	Zn	422	2	S6
Ru-TBP	H_4TBP	None	441	4	S6
DBP-UiO	H_2DBP	None	558	4	S7
PCN-222	H_2TCPP	None	1728	4	S8
Gd-TCPP	TCPP	None	646.4	4	This work
Gd-TCPP/MgO	TCPP	None	608.6	4	This work
Gd-$(H_2TCPP)^{2+}$	TCPP	H	169.96	1	This work

Table S1. Summary of the different porphyrin-based MOFs materials.

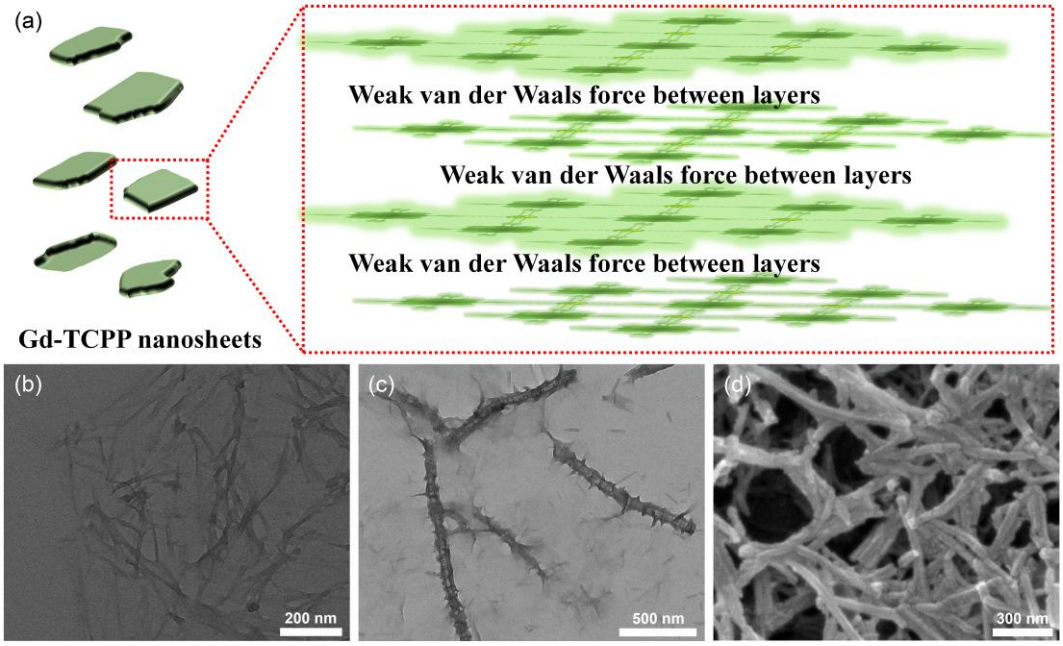

Figure S16. (a) Schematic diagram of the layered Gd-TCPP nanosheets. (b, c) TEM and (d) SEM images of the acid-treated Gd-TCPP nanosheets.

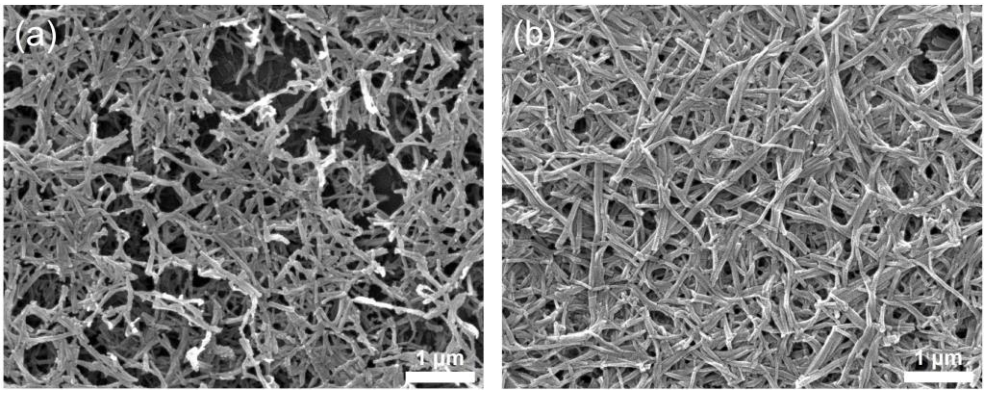

Figure S17. SEM images of the Gd-TCPP with the acid-treated at (a) pH=3.0 and (b) pH=0.5.

References

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