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) N₂ adsorption-desorption isotherms, and (d) pore size distribution of the Gd-(H₂TCPP)²⁺. The Gd-(H₂TCPP)²⁺ showed an approximate type II Langmuir isotherms with a Brunauer-Emmett-Teller (BET) surface area of 169.96 m² 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$_2$O$_3$, and (d) Gd-TCPP/CuO nanohybrids.
Figure S9. XRD patterns of the Gd-TCPP/MnO, Gd-TCPP/MgO, Gd-TCPP/Fe$_2$O$_3$, 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$_2$O$_3$, 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\textsubscript{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\textsuperscript{2} g\textsuperscript{-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$_2$O$_3$ nanohybrids.
**Figure S15.** TEM images of the acid-treated Gd-ZnTCPP/ZnO nanohybrids.
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**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


