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Supplementary Materials for

Molecular-caged metal-organic frameworks for energy management

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Figs. S1 to S20
Tables S1 to S4

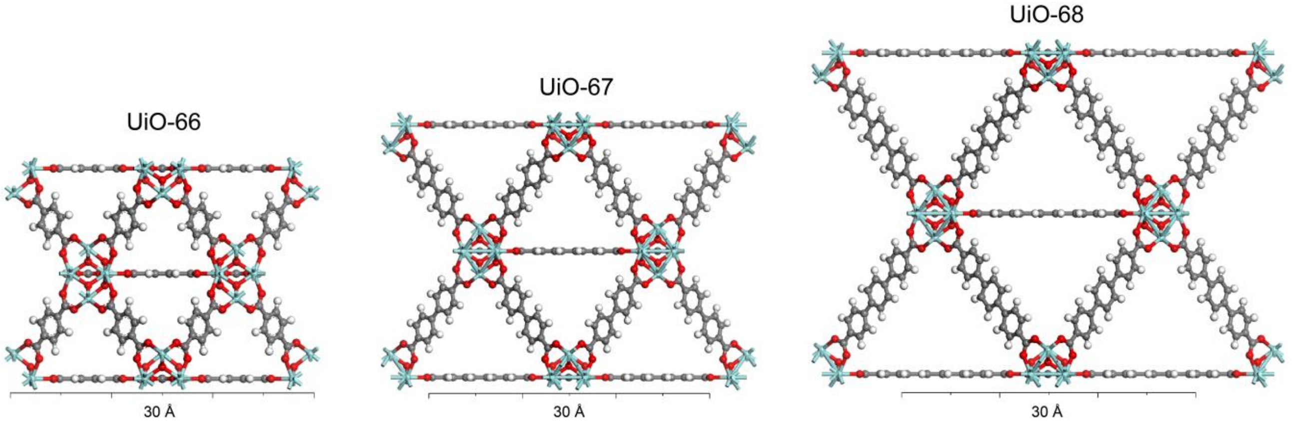

Fig. S1 Framework structures of UiO-66, UiO-67 and UiO-68

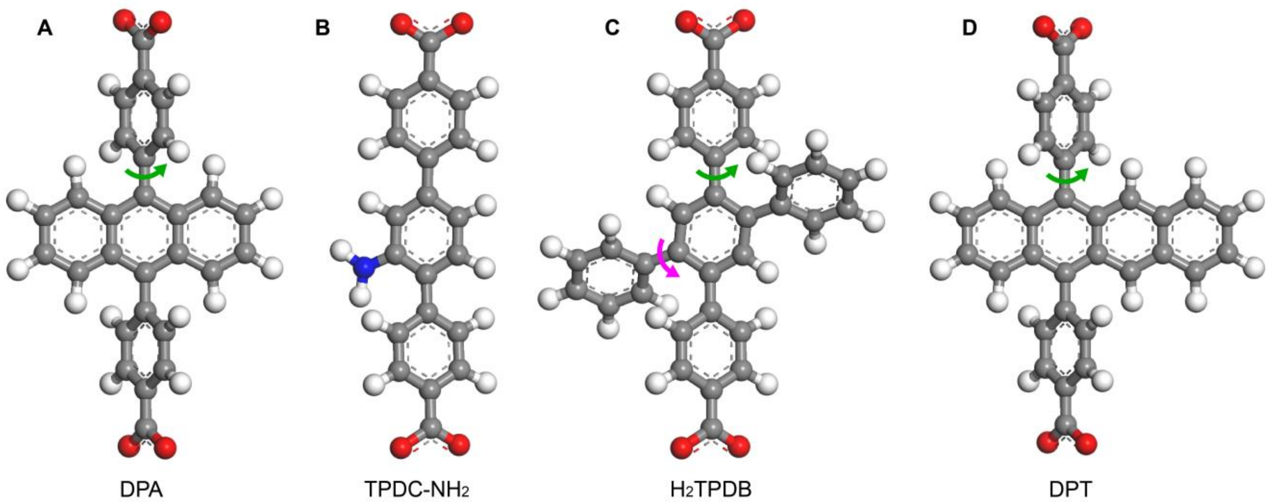

Fig. S2 Ligand selection for constructing molecular cages

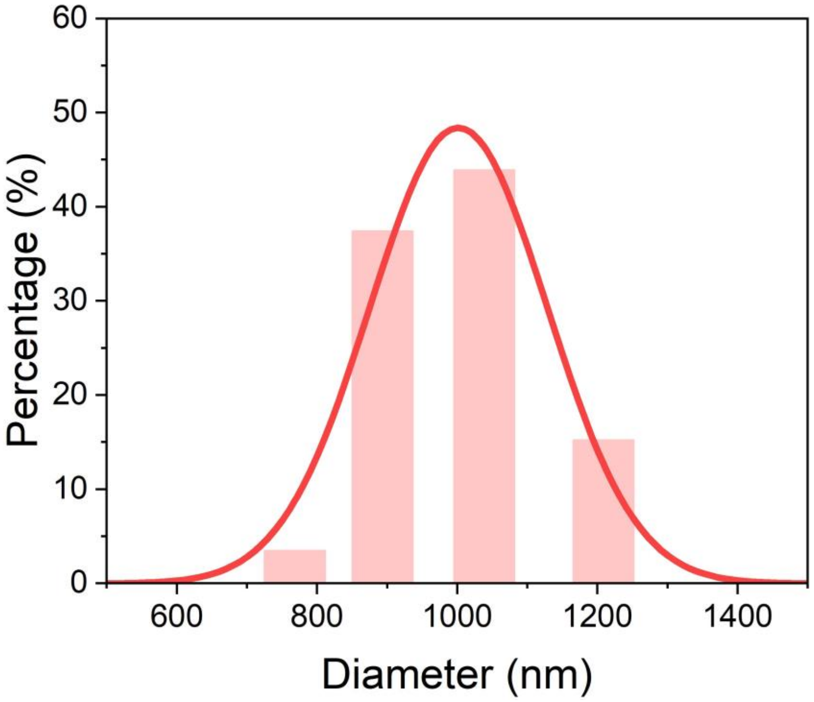

Fig. S3 Particle size distribution of UiO-68

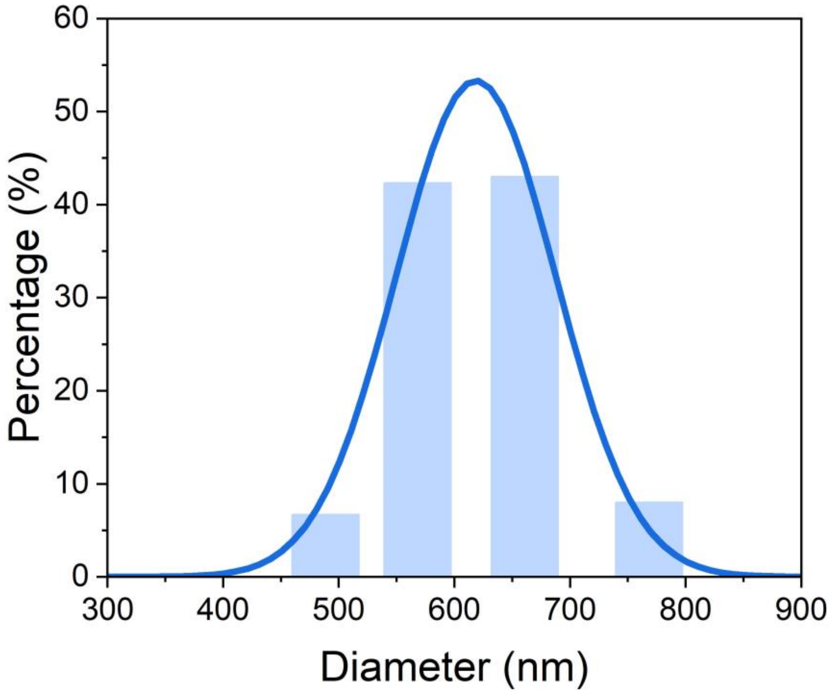

Fig. S4 Particle size distribution of Zr-DPA

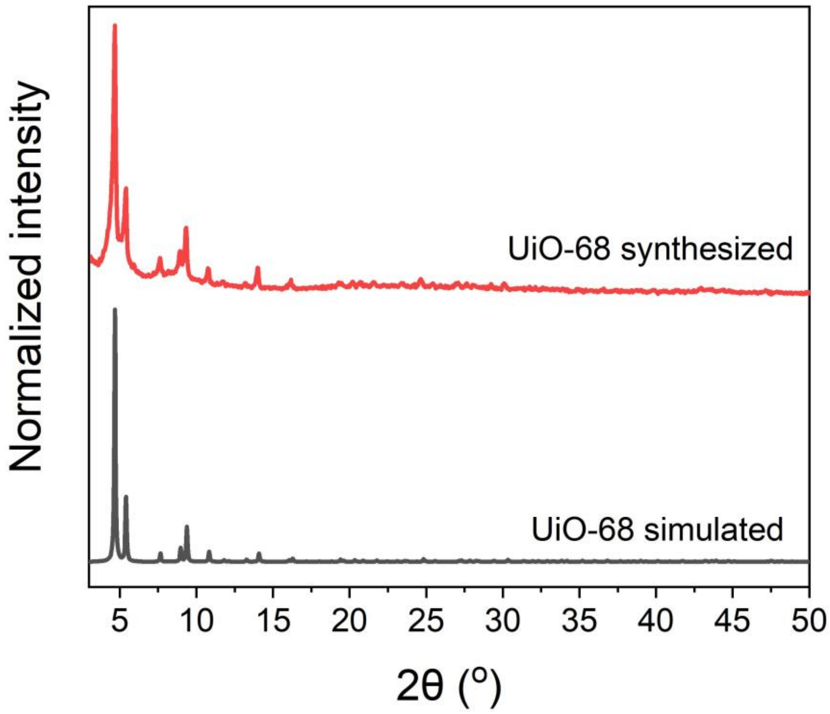

Fig. S5 Synthesized and simulated UiO-68 XRD spectra

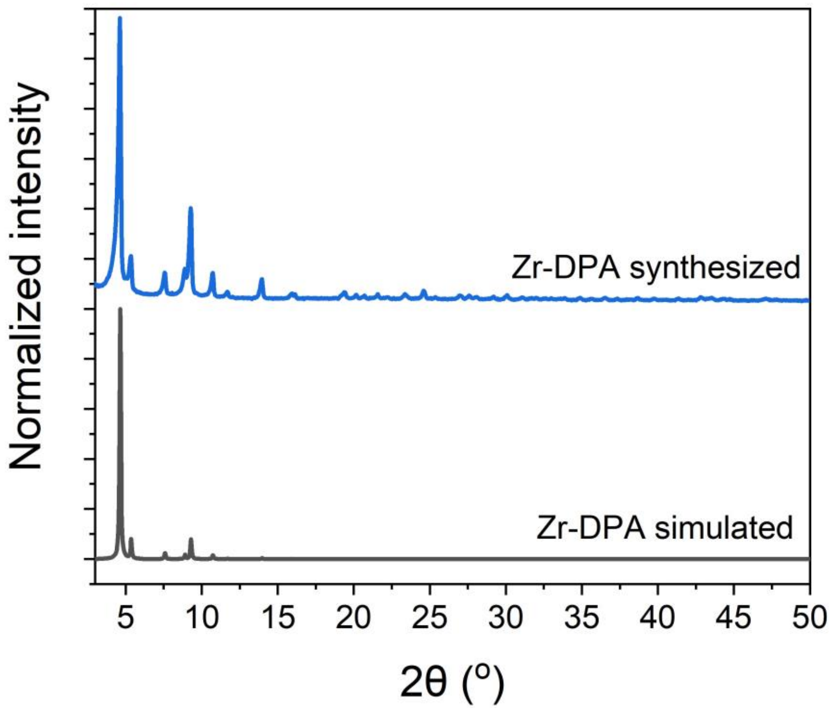

Fig. S6 Synthesized and simulated Zr-DPA XRD spectra

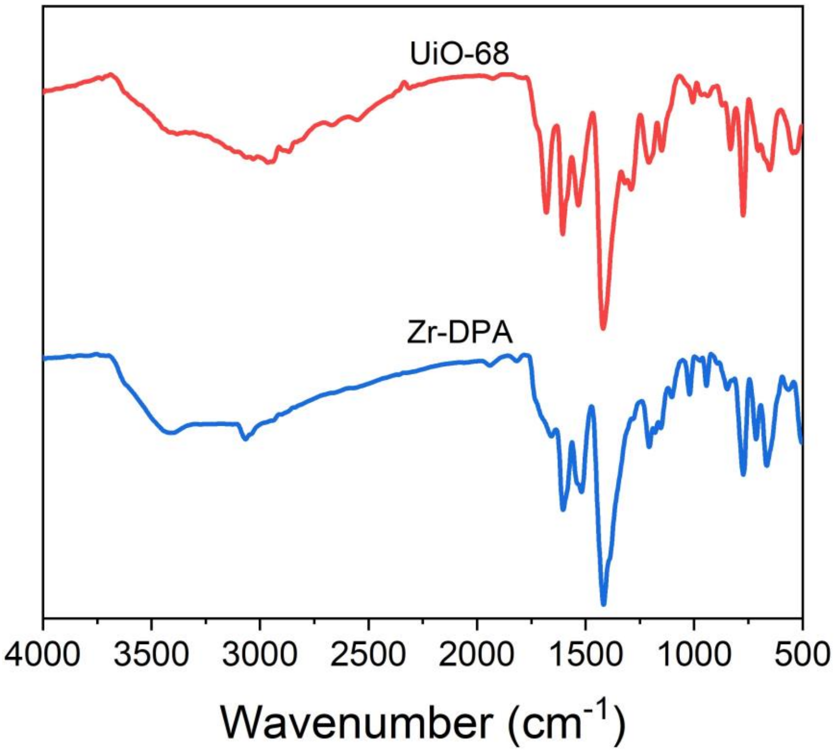

Fig. S7 Infrared spectra of UiO-68 and Zr-DPA

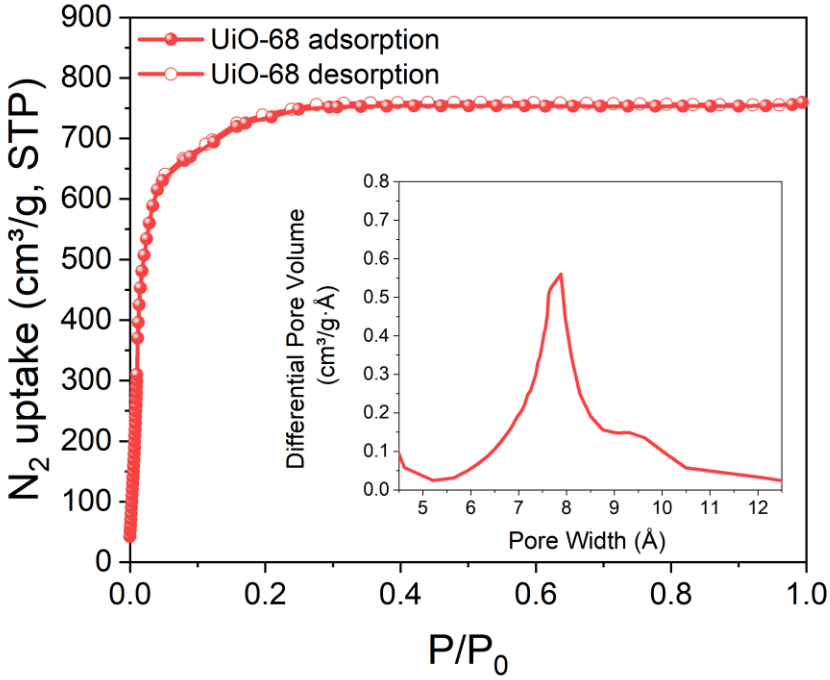

Fig. S8 Nitrogen adsorption-desorption curves and microporous analysis of UiO-68

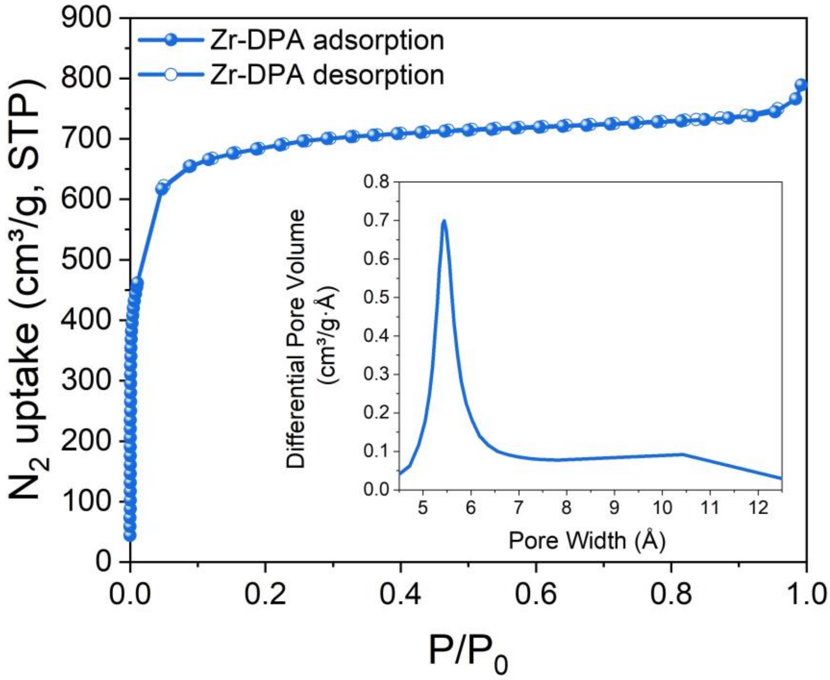

Fig. S9 Nitrogen adsorption-desorption curves and microporous analysis of Zr-DPA

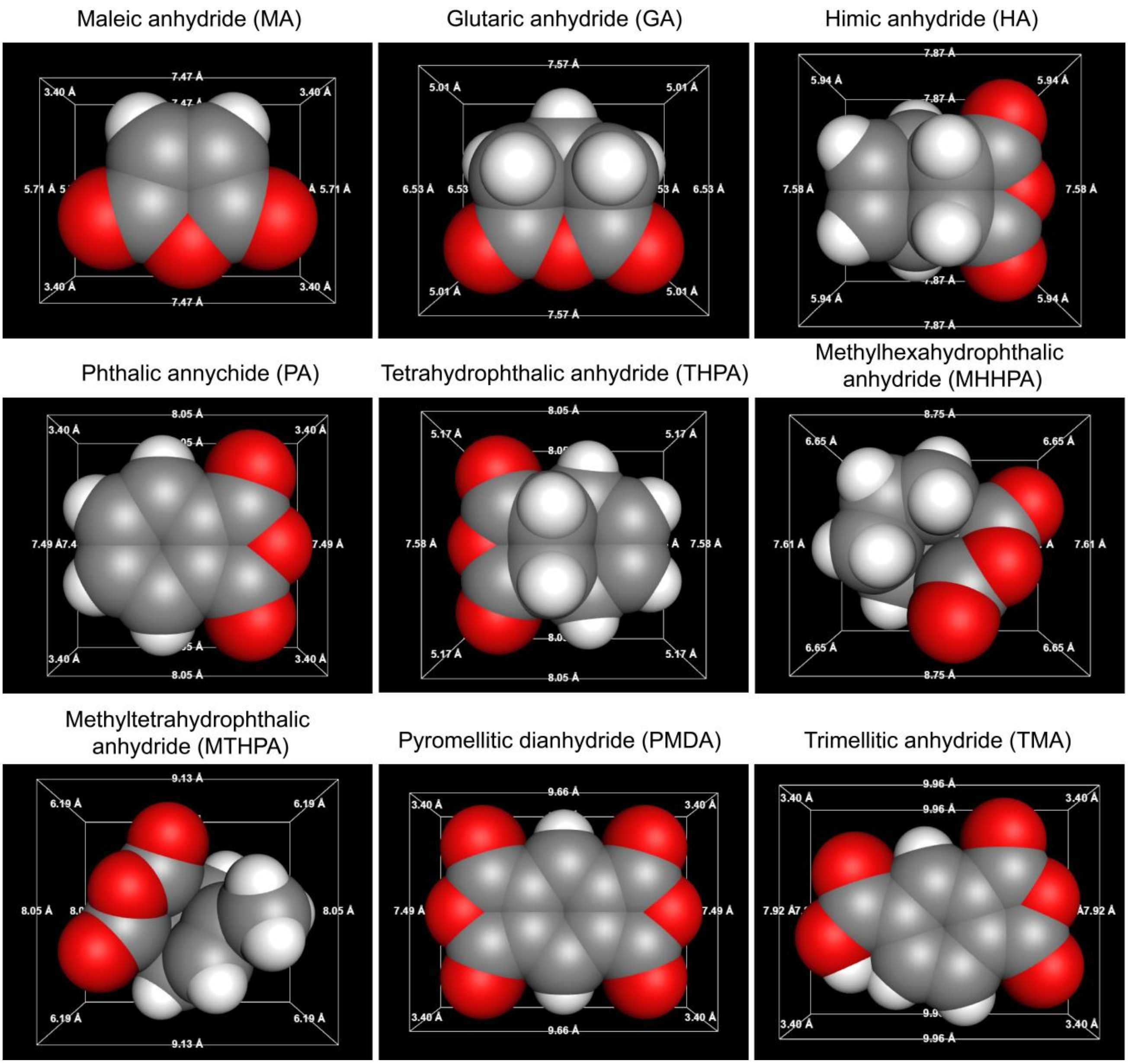

Fig. S10 Molecular sizes of nine common epoxy anhydride curing agents

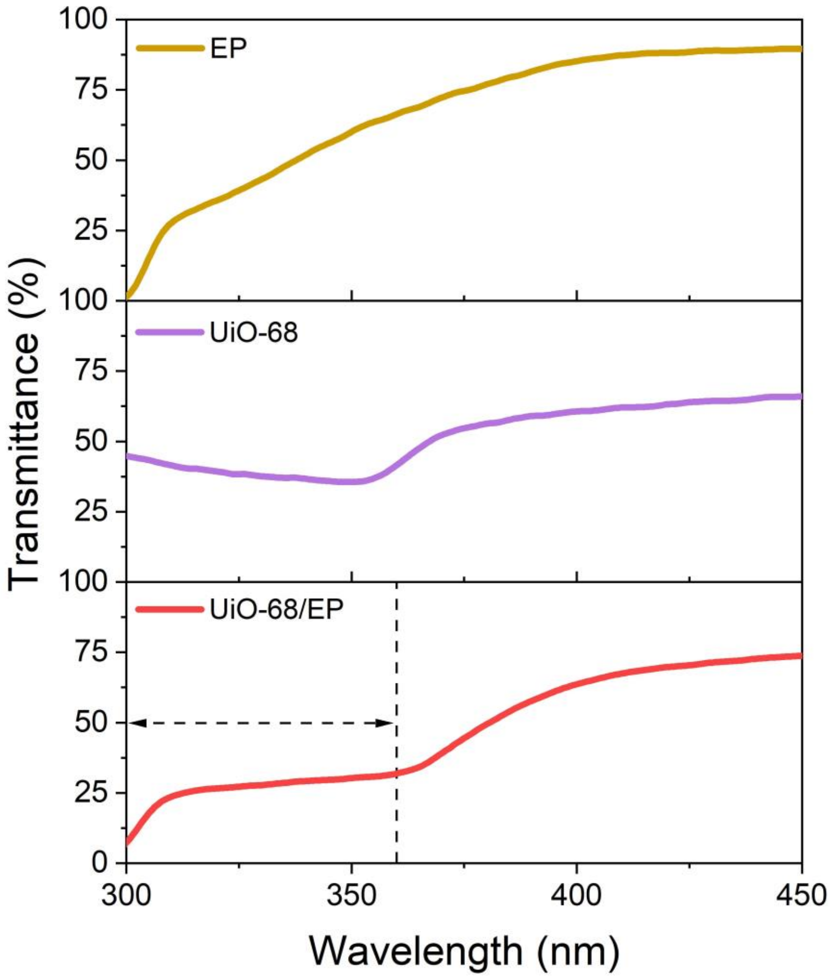

Fig. S11 Construction process of UV shielding in UiO-68/EP

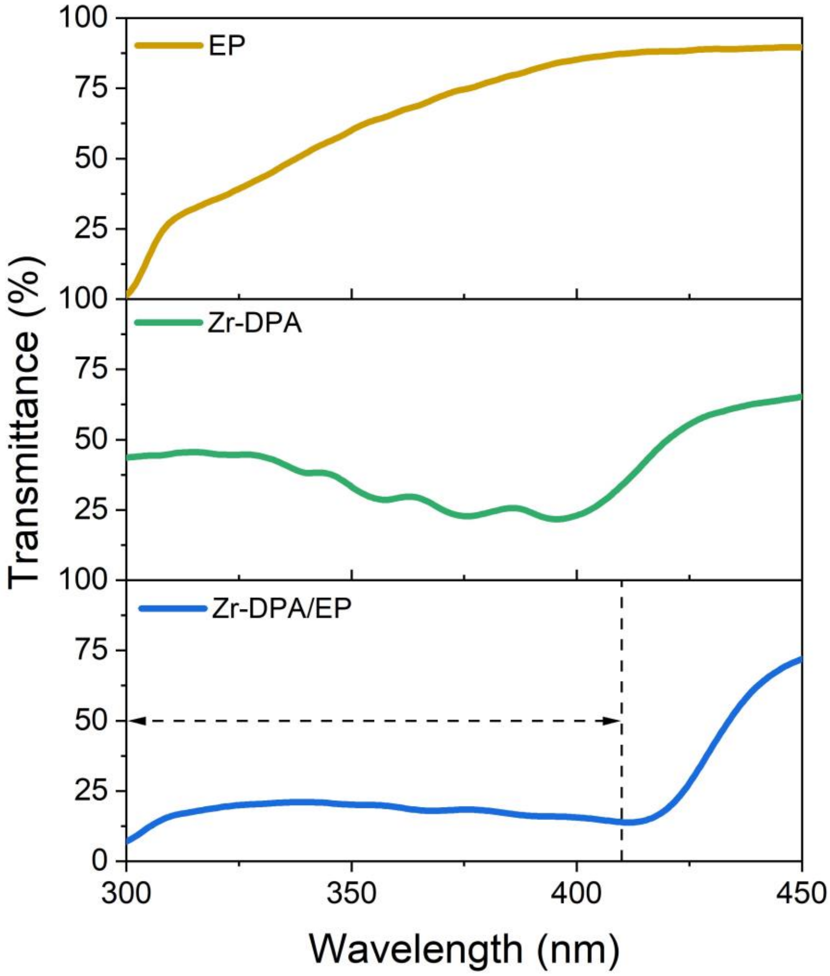

Fig. S12 Construction process of UV shielding in Zr-DPA/EP

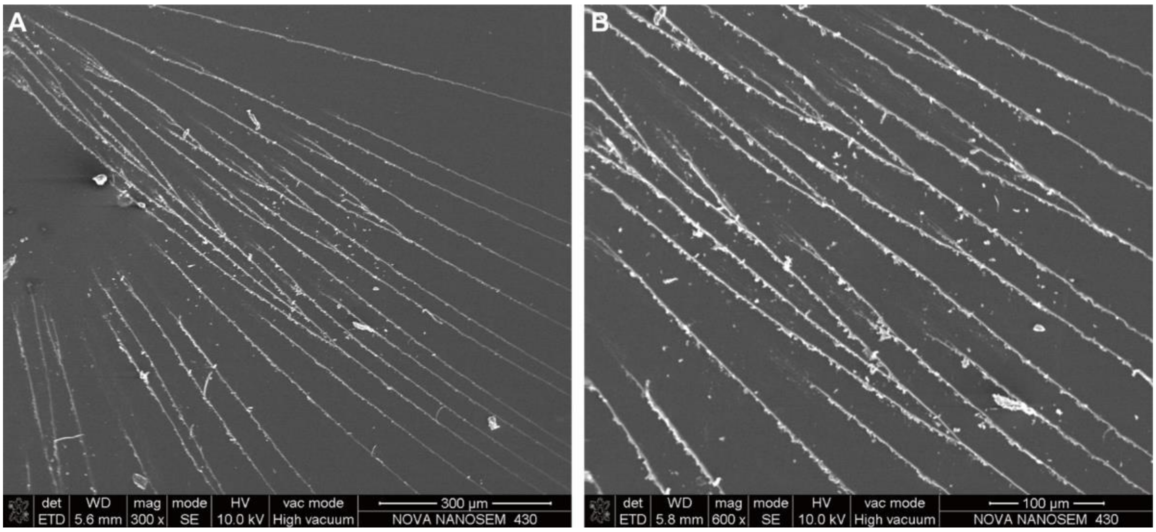

Fig. S13 SEM micrographs of the fracture surface of pure EP at (A) 300x magnification and (B) 600x magnification.

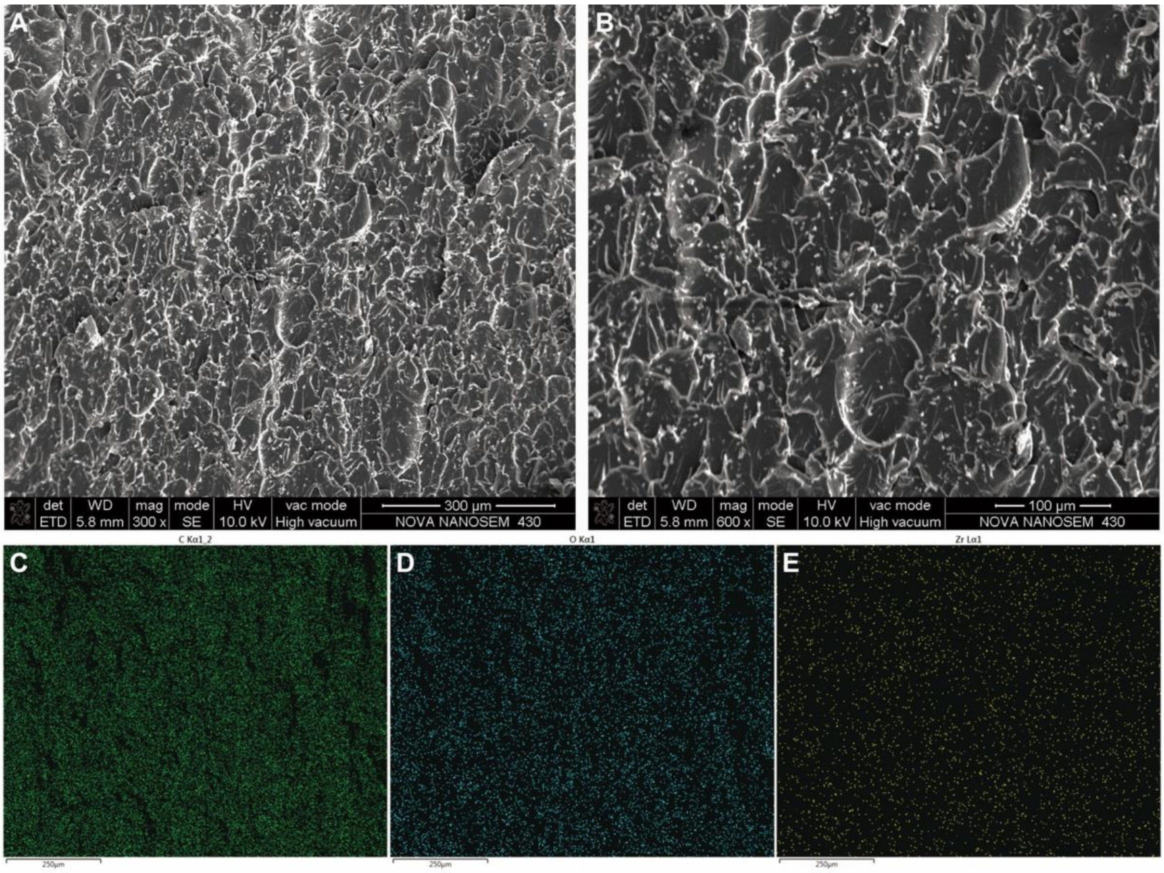

Fig. S14 SEM micrographs of the fracture surface of UiO-68/EP at (A) 300x magnification and (B) 600x magnification. EDS mapping and elemental distributions of (C) C, (D) O and (E) Zr

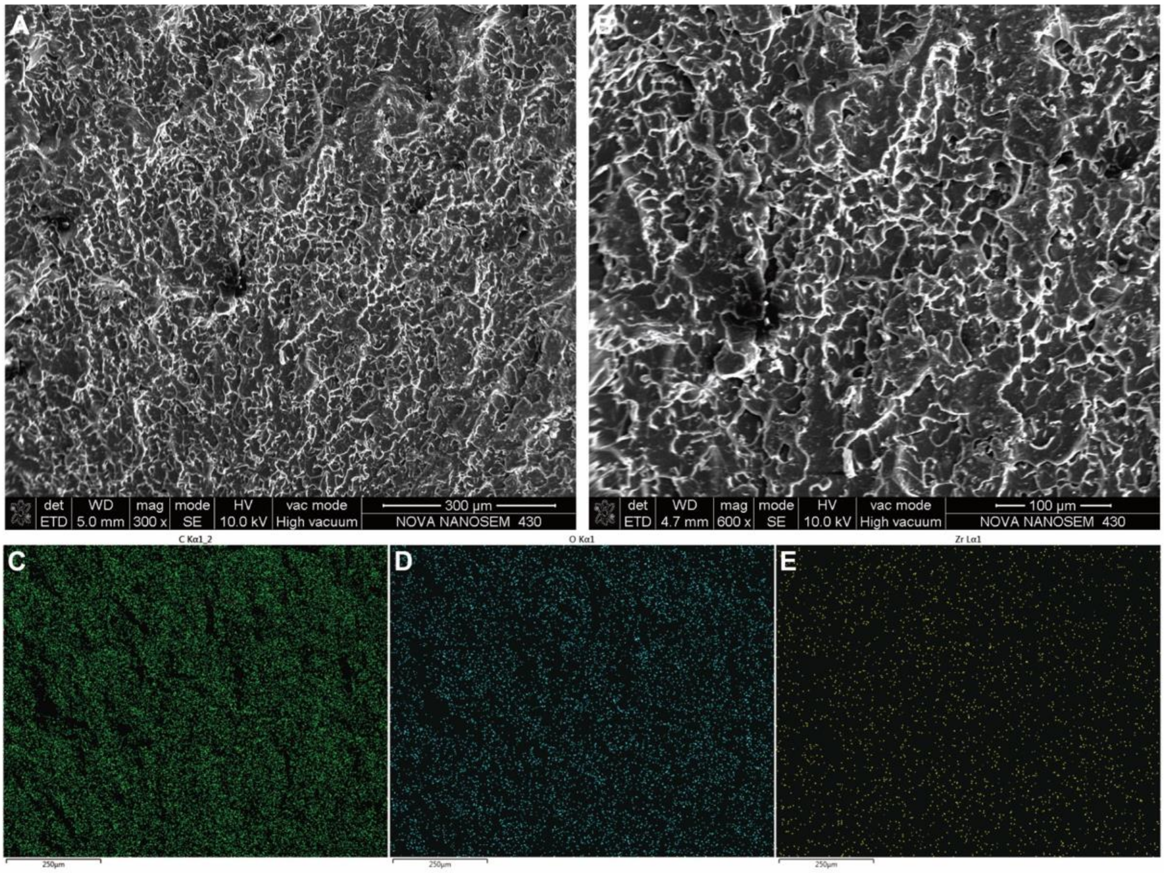

Fig. S15 SEM micrographs of the fracture surface of Zr-DPA/EP at (A) 300x magnification and (B) 600x magnification. EDS mapping and elemental distributions of (C) C, (D) O and (E) Zr

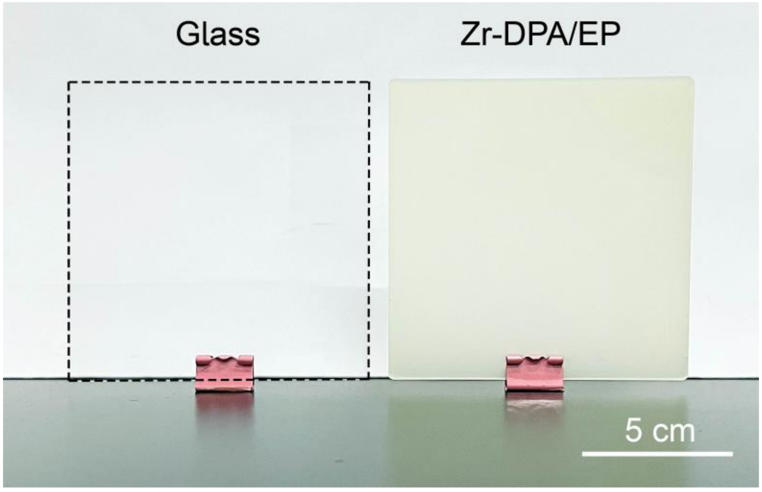

Fig. S16 Photographs of glass and Zr-DPA/EP large samples

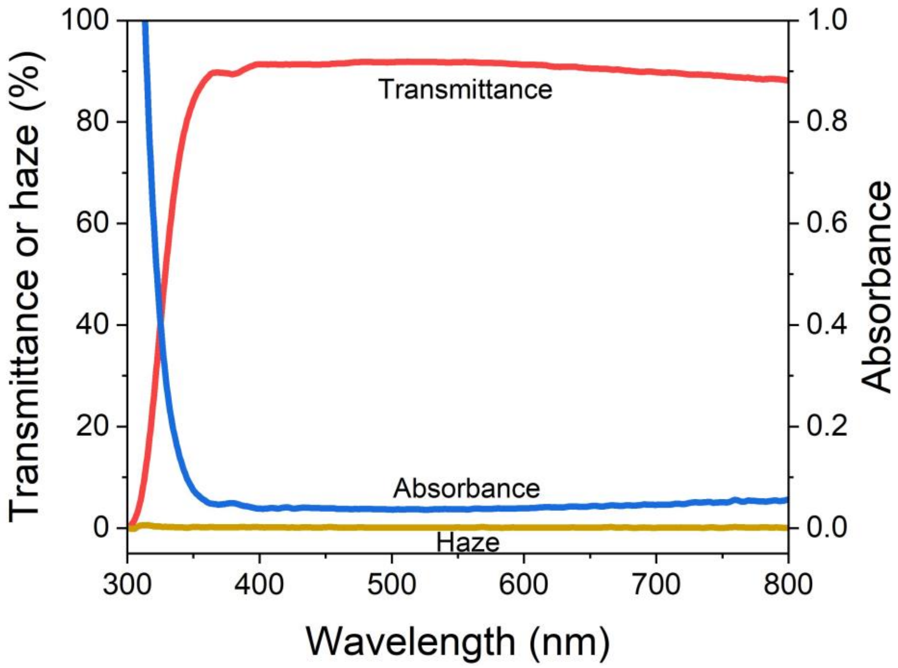

Fig. S17 optical properties of glass

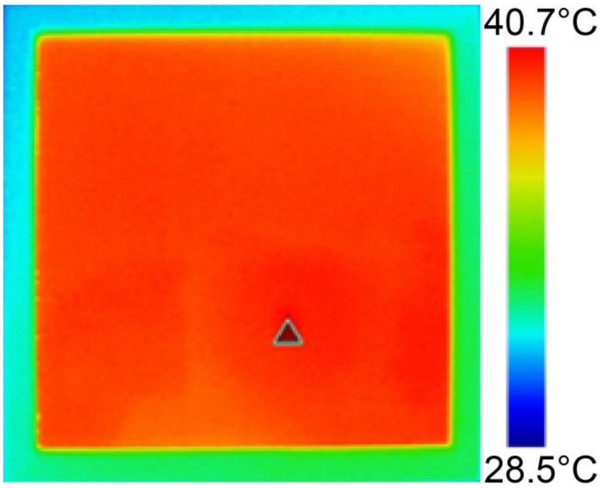

Fig. S18 Infrared thermal imaging of glass after 30s on a hot plate

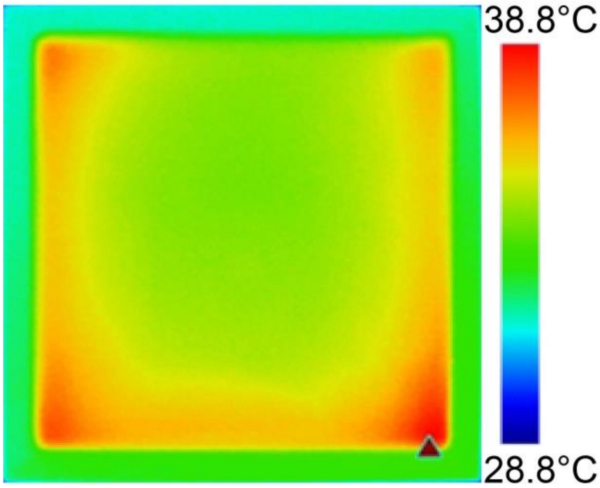

Fig. S19 Infrared thermal imaging of Zr-DPA/EP after 30s on a hot plate

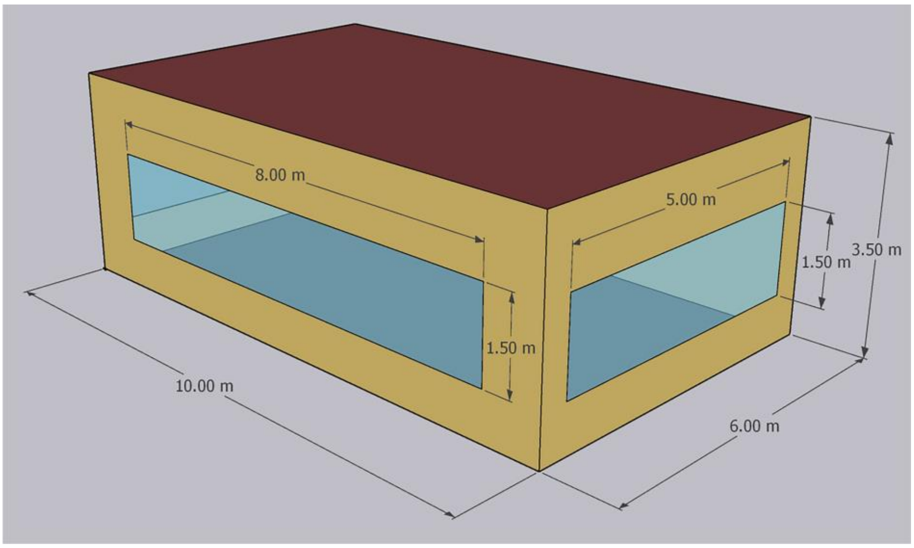

Fig. S20 Building models for Energyplus simulation

Table S1 Oxygen transmission rate (OTR) of the MOF/Polymer

Samples	OTR (mL m^{-2} day^{-1})
Pure EP	26±4
UiO-68/EP	1600±300
Zr-DPA/EP	5700±1300

Table S2 Comparison of this work with previously reported epoxy-containing optical composites in terms of transmittance and haze

Materials	Transmittance	Haze	Ref. (in main article)
Solar-assisted TW*	90	60	25
MTB	69	50	26
Aesthetic TW	80	93	27
Anisotropic TW	80	90	28
UFT	80	58	29
PSMTW	60	95	30
TBW	88	74	31
EP/DDM/PB-5	67	22	32
EP-DDT7	75	11	33
W/VO_2-TPW-L	68	97	34
EP/4DIT	89	14	35
TB** with PTGE	79	72	36
Zr-DPA/EP	83	93	This work

TW* represents transparent wood filled with epoxy resin.

TB** represents transparent bamboo filled with epoxy resin.

Table S3 Comparison of this work with previously reported epoxy-containing composites for building in terms of thermal conductivity

Materials	Thermal conductivity (W m^{-1} K^{-1})	Ref. (in main article)
TB** with PTGE	0.35	36
Clear wood	0.35	37
TB with E51/DETA	0.33	38
ESMTW*	0.29	39
TB with Ag-80/DDM	0.25	40
Aesthetic TW	0.24	27
Silica xerogel/epoxy	0.22	41
W/VO_2-TPW-L	0.20	34
TBW	0.20	31
Zr-DPA/EP	0.16	This work

TW* represents transparent wood filled with epoxy resin.

TB** represents transparent bamboo filled with epoxy resin.

Table S4 Parameters of Zr-DPA/EP for EnergyPlus calculations

Variables	Zr-DPA/EP
Solar Transmittance	0.76
Solar Front Reflectance	0.08
Solar Back Reflectance	0.08
Visible Transmittance	0.83
Visible Front Reflectance	0.09
Visible Back Reflectance	0.09
Emissivity	0.85