Supporting Materials

High-throughput screening of nano-hybrid metal-organic-frameworks for photocatalytic CO₂ reduction

Moin Khwaja
Takuya Harada

Figure S1: Types of heterojunctions

Type I   Type II   Type III
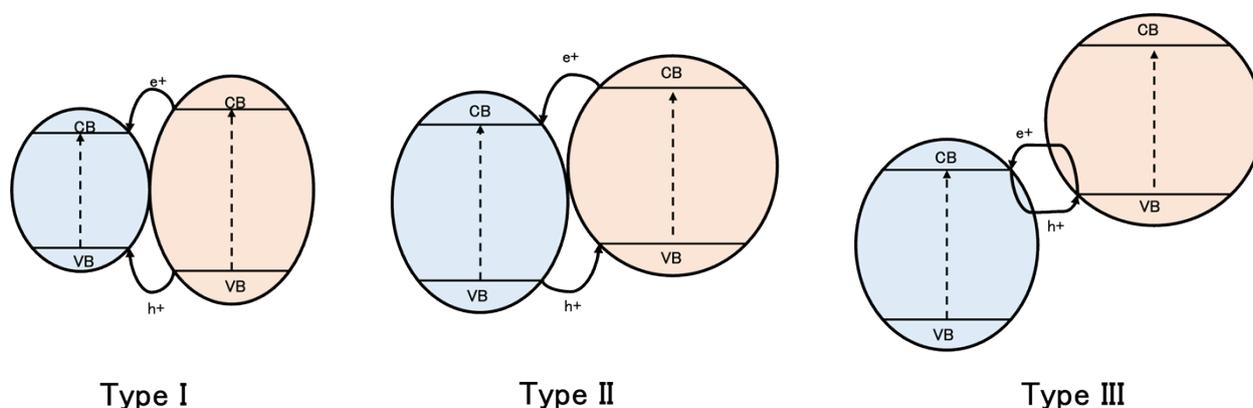
Showcasing the three types of heterojunctions that can occur between two semiconductors.

Table S1: Software version

Software	Version
Materials Project	V2023.11.1
QMOF	2021-12-10
MOFSimplify	1.0.0

Table S2: Database DFT Functionals

Database	DFT Functionals
Materials Project	density functional theory calculations were carried out using the Vienna ab initio Simulation Package (VASP). Projector augmented waves pseudopotentials with exchange correlation functionals were used as parameterized by Perdew–Burke–Ernzerhof. Core electrons were modeled with an energy cutoff of 520 eV. A baseline k-point mesh of 1000/(number of atoms in the cell) is used for all computations. Specifically, the Monkhorst-Pack method is used for the k-point choices (with Γ-centered for hexagonal cells), and the tetrahedron method is used to perform

	the k-point integration. a k-point mesh of 1000 per reciprocal atom (pra) was used.
QMOF	density functional theory calculations were carried out using the Vienna ab initio Simulation Package (VASP) v.5.4.4. Perdew–Burke–Ernzerhof exchange- correlation functional with Grimme's D3 dispersion correction and Becke–Johnson (BJ) damping was used. A 520 eV plane-wave kinetic energy cutoff was applied with a k-point density of ~1000 per number of atoms, as arranged using Pymatgen 2019.9.16. Gaussian smearing of the band occupancies with a smearing width of 0.01 eV was applied, with extrapolation back to the 0 K limit. Symmetry operations were disabled. The SCF was converged using the "Fast" algorithm, which is a mixture of the Davidson and residual minimization method–direct inversion in the iterative subspace (RMM-DIIS) algorithms

Table S3: Passing inorganic-core materials for reduction to CO.

						CO		
Material number	**Material ID**	**Composition**	**Band Gap**	**CBM**	**VBM**	**Gibbs Free at 7pH (Water Stability)**	**pH stability pass rate**	**Synthesized**
1	'mp-9576'	[K-Sb-Se]	2.40	-0.362	2.034	0.332	0.7	
2	'mp-1205478'	[F-Sb-Se]	2.70	-0.463	2.233	0.267	0.8	yes
3	'mp-1095291'	[Li-Se-Sn]	2.35	-0.412	1.937	0.480	0.5	yes
4	'mp-29420'	[Cl-Hf-Se]	2.17	-0.256	1.919	0.494	0.5	yes
5	'mp-20310'	[In-Li-Se]	2.47	-0.249	2.224	0.269	0.7	yes
6	'mp-675710'	[K-O-U]	2.90	-0.475	2.429	0.086	1	
7	'mp-1181839'	[Cs-Se-Sn-Sr]	2.46	-0.151	2.314	0.458	0.5	
8	'mp-1213022'	[Er-O-Rh]	2.60	-0.125	2.475	0.143	1	
9	'mp-30996'	[Au-Br-Rb]	2.43	-0.155	2.275	0.376	1	
10	'mp-15222'	[Cu-Nb-Rb-Se]	2.46	-0.342	2.118	0.500	0.5	
11	'mp-1227444'	[Bi-Br-O-Pb]	2.71	-0.440	2.265	0.080	1	
12	'mp-1224517'	[Hf-O-Pb-Te]	2.58	-0.408	2.170	0.103	1	
13	'mp-626218'	[H-O-Sb]	2.82	-0.214	2.602	0.137	1	
14	'mp-27175'	[F-In-O]	2.68	-0.163	2.513	0.102	1	yes
15	'mp-1821'	[Se-W]	2.25	-0.259	1.988	0.217	0.6	yes
16	'mp-1025549'	[Se-Tl-V]	2.41	-0.173	2.238	0.141	0.8	yes
17	'mp-27852'	[Cl-Hg-Te]	2.85	-0.178	2.674	0.145	0.8	
18	'mp-505700'	[In-K-Se]	2.35	-0.135	2.219	0.210	0.7	yes
19	'mp-559257'	[Ag-O-Te]	2.76	-0.148	2.614	0.144	1	yes

Table S4: Passing inorganic-core materials for reduction to HCOOH.

			HCOOH					
Material number	Material ID	Composition	Band Gap	CBM	VBM	Gibbs Free at 7 pH(Water Stability)	pH stability pass rate	Synthesized
1	'mp-555027'	[Bi-Cd-Ge-O]	3.00	-0.008	2.989	0.036	1	yes
2	'mp-1205997'	[F-Na-U]	2.89	-0.021	2.872	0.267	1	
3	'mp-17972'	[F-Hg-O-Zn]	2.51	-0.113	2.396	0.391	1	yes
4	'mp-645663'	[Br-Mo-Se-Te]	2.29	-0.028	2.258	0.234	0.7	yes
5	'mp-1112940'	[Ag-Cl-Cs-Sb]	2.97	-0.002	2.965	0.308	1	
6	'mp-13595'	[F-Rb-U]	2.04	-0.039	2.005	0.367	0.8	yes
7	'mp-540940'	[Se-Ti-Tl]	2.84	-0.038	2.805	0.367	0.7	yes
8	'mp-1206763'	[Ba-O-Sc-U]	1.97	-0.026	1.939	0.274	1	
9	'mp-1102254'	[Cs-Ge-Se]	2.57	-0.093	2.475	0.499	0.5	yes
10	'mp-1228258'	[Ba-Li-O-Te]	2.68	-0.034	2.650	0.297	0.9	
11	'mp-756769'	[C-Na-O-P-Tl]	2.93	-0.105	2.821	0.223	1	
12	'mp-694961'	[Na-Nd-O-Sr-Ti]	2.40	-0.022	2.382	0.123	1	
13	'mp-1207110'	[K-Nb-O-Ta]	2.55	-0.057	2.488	0.137	1	

Table S5: Passing inorganic-core materials for reduction to CH_4.

CH4								
Material number	**Material ID**	**Composition**	**Band Gap**	**CBM**	**VBM**	**Gibbs Free at 7 pH(Water Stability)**	**pH stability pass rate**	**Synthesized**
1	'mp-1224154'	[K-O-P-Pd]	2.97	0.116	3.084	0.215	1	
2	'mp-29359'	[Cl-Na-Pd]	2.99	0.084	3.074	0.368	1	yes
3	'mp-1223088'	[Cu-La-O-S-Se]	2.15	0.165	2.320	0.418	0.7	
4	'mp-10559'	[Au-Gd-O]	2.74	0.093	2.830	0.317	0.8	yes
5	'mp-1214066'	[Ag-Ca-F-Hf]	2.72	0.151	2.872	0.212	1	
6	'mp-1025252'	[Cl-Cs-Mn]	2.94	0.028	2.966	0.424	1	
7	'mp-1194963'	[O-P-Pd-Tl]	2.87	0.124	2.996	0.218	1	yes
8	'mp-28145'	[Cl-Pd-Rb]	2.75	0.026	2.778	0.402	1	yes
9	'mp-546672'	[Bi-I-La-O]	2.12	0.043	2.163	0.208	1	yes
10	'mp-1214730'	[Ba-Ca-Cu-F-Ga]	3.00	0.001	2.997	0.212	1	
11	'mp-1210192'	[Br-Fe-Na]	1.92	0.142	2.066	0.468	0.6	
12	'mp-571648'	[Cl-Mn-Rb]	2.63	0.016	2.644	0.434	1	yes
13	'mp-1219278'	[O-Pb-Sb-Sc]	2.35	0.143	2.497	0.053	1	
14	'mp-1104024'	[Cs-Ge-Se]	2.57	0.115	2.685	0.377	0.7	yes
15	'mp-13676'	[O-P-Tl]	2.44	0.026	2.461	0.313	1	yes
16	'mp-1018891'	[Cl-Pd]	2.32	0.141	2.461	0.376	1	yes
17	'mp-1226577'	[Ce-O-Th]	2.86	0.053	2.913	0.018	1	
18	'mp-3879'	[Ba-Cu-F]	2.85	0.150	3.004	0.248	1	yes
19	'mp-505436'	[Cu-O-P]	2.20	0.100	2.300	0.361	0.9	yes
20	'mp-1210257'	[F-Na-Ti]	1.85	0.058	1.911	0.388	0.9	yes

21	'mp-557993'	[Bi-O]	1.98	0.116	2.098	0.282	1	
22	'mp-541696'	[Cl-Cs-Tl]	2.97	0.064	3.037	0.359	1	yes
23	'mp-984519'	[As-Na-Se]	2.00	0.109	2.106	0.368	0.6	yes
24	'mp-856'	[O-Sn]	2.69	0.037	2.727	0.000	1	yes
25	'mp-1209628'	[Ga-Rb-Se-Sn]	2.17	0.122	2.296	0.215	0.7	
26	'mp-557871'	[As-Cu-O-Pb]	3.00	0.093	3.091	0.066	1	yes

Table S6: Passing MOF-shell materials for reduction to CO.

				CO				
qmof_id	PLD	CBM	VBM	Band Gap	Water Stability	Solvent Stability	Synthesized	OMS
qmof-2c7948e	9.59	0.16	-1.64	1.81	0.92	0.92	yes	yes
qmof-6032da7	5.12	0.52	-2.47	2.99	0.59	0.69	yes	
qmof-2297abb	5.01	0.65	-1.73	2.39	0.64	0.88		
qmof-167482e	4.82	0.65	-1.21	1.86	0.87	0.82		
qmof-def2fe1	6.92	0.18	-2.23	2.41	0.58	0.85		
qmof-a40de84	4.99	0.62	-2.10	2.73	0.82	0.74	yes	
qmof-b050ede	6.12	0.23	-2.13	2.36	0.6	0.64		yes
qmof-44d0651	5.89	0.35	-1.88	2.23	0.65	0.55		
qmof-95ce74c	11.71	0.31	-2.66	2.97	0.64	0.9	yes	
qmof-99d7983	4.64	0.61	-2.09	2.70	0.62	0.74	yes	
qmof-417c826	7.22	1.24	-1.46	2.70	0.79	0.78	yes	
qmof-3eec122	5.02	0.79	-1.04	1.83	0.73	0.88	yes	
qmof-b1e5ed5	4.67	1.18	-1.58	2.76	0.56	0.93	yes	
qmof-bec91df	5.02	0.25	-2.55	2.79	0.64	0.57		
qmof-cca3b22	5.51	0.33	-2.05	2.39	0.59	0.59		yes
qmof-096bf27	4.54	0.86	-1.50	2.37	0.72	0.79	yes	
qmof-97f5f79	4.55	1.41	-1.03	2.43	0.64	0.9	yes	
qmof-e2185c7	4.95	0.34	-1.75	2.10	0.64	0.75		yes
qmof-aa8159f	4.90	1.08	-0.73	1.80	0.51	0.75	yes	
qmof-f0c1c90	5.10	0.15	-2.75	2.90	0.54	0.82	yes	
qmof-55ae928	4.89	1.11	-0.68	1.78	0.56	0.75	yes	yes
qmof-b078db5	4.91	0.44	-1.41	1.85	0.7	0.71		
qmof-03dce70	4.89	1.40	-1.18	2.58	0.54	0.8	yes	
qmof-a758683	4.51	0.35	-1.87	2.22	0.72	0.79		yes
qmof-ba63d77	4.94	0.42	-2.35	2.77	0.88	0.83		

qmof-4695aa0	6.09	1.57	-1.01	2.59	0.61	0.78		
qmof-537f47f	6.41	0.42	-2.36	2.78	0.57	0.87		
qmof-58a8f42	5.43	0.28	-2.43	2.71	0.89	0.8	yes	
qmof-26670ca	8.81	1.06	-1.76	2.83	0.88	0.62	yes	
qmof-05cc789	4.90	1.11	-0.68	1.78	0.57	0.75	yes	yes
qmof-a5a3523	4.95	1.21	-0.57	1.78	0.52	0.75	yes	
qmof-8333f8b	5.09	1.09	-1.12	2.20	0.64	0.78	yes	
qmof-aa12b02	5.90	0.79	-1.08	1.87	0.99	0.92	yes	
qmof-361324a	5.59	0.15	-2.73	2.88	0.61	0.8		yes
qmof-9b8979a	4.86	0.25	-1.96	2.22	0.84	0.83		
qmof-4581200	7.35	0.34	-2.56	2.90	0.7	0.51		
qmof-ee8825a	7.34	0.13	-2.83	2.96	0.87	0.66	yes	
qmof-b7fb8de	7.17	0.20	-2.25	2.45	0.84	0.88	yes	
qmof-8f5113c	6.26	0.48	-2.32	2.80	0.84	0.89	yes	
qmof-c1bc002	6.48	0.28	-1.91	2.19	0.62	0.61		
qmof-c924489	5.57	0.35	-2.04	2.39	0.55	0.75		
qmof-02d0b18	7.17	0.15	-2.57	2.72	0.61	0.79		
qmof-31585f8	6.25	0.57	-2.17	2.74	0.52	0.79	yes	
qmof-a0717aa	5.29	0.52	-1.81	2.33	0.54	0.86	yes	
qmof-5382407	6.76	1.43	-1.24	2.66	0.75	0.91	yes	
qmof-d6024b8	7.16	0.22	-2.70	2.93	0.65	0.79		
qmof-4e43b18	5.23	0.37	-1.55	1.92	0.52	0.81	yes	
qmof-2bf3de2	6.05	1.23	-1.40	2.63	0.95	0.95	yes	
qmof-ef79893	5.73	1.05	-1.70	2.75	0.66	0.9		yes
qmof-b6953dc	4.53	0.71	-2.28	2.99	0.88	0.87		
qmof-2095c92	4.92	0.72	-2.19	2.91	0.71	0.9		
qmof-81886cf	5.92	0.33	-2.62	2.96	0.71	0.75		

qmof-14a36ed	4.52	0.51	-1.45	1.96	0.51	0.77		
qmof-e2af422	7.65	0.31	-1.48	1.79	0.62	0.9	yes	yes
qmof-28498f0	6.79	0.44	-2.10	2.55	0.59	0.62		
qmof-47c6a17	4.56	0.75	-1.97	2.72	0.92	0.65	yes	
qmof-f124941	6.81	0.36	-2.21	2.57	0.81	0.91	yes	yes
qmof-1f7477f	4.98	0.47	-2.27	2.74	0.65	0.91	yes	
qmof-25dcace	4.62	0.67	-1.63	2.30	0.63	0.88		
qmof-e471501	5.16	0.82	-1.99	2.81	0.77	0.84		yes
qmof-f203c62	6.38	0.49	-2.43	2.93	0.81	0.91	yes	
qmof-5b5c508	5.24	0.45	-1.83	2.28	0.59	0.8		
qmof-0f178f1	4.95	1.65	-0.08	1.73	0.64	0.94	yes	yes
qmof-c1553ca	4.65	0.45	-2.33	2.78	0.71	0.91	yes	yes
qmof-e2ef939	6.12	0.31	-2.18	2.49	0.84	0.62	yes	
qmof-08021a9	7.00	0.55	-1.71	2.26	0.58	0.95	yes	yes
qmof-96f2489	5.64	0.64	-1.73	2.38	0.61	0.74		
qmof-f0e967a	4.96	2.19	0.44	1.75	0.54	0.88	yes	
qmof-8b975ac	4.55	0.18	-2.62	2.79	0.85	0.62		
qmof-e647ae3	5.10	1.09	-1.57	2.65	0.58	0.9	yes	yes
qmof-961be1d	5.33	0.32	-2.46	2.78	0.62	0.91	yes	
qmof-c88e03d	4.76	0.20	-2.16	2.36	0.71	0.86		yes
qmof-f45cbc6	5.18	1.39	-0.62	2.01	0.57	0.61		
qmof-59219a7	5.18	0.53	-1.68	2.21	0.62	0.81	yes	yes
qmof-18e2d2f	4.84	0.24	-2.69	2.92	0.88	0.82		
qmof-5ea5aaa	5.06	0.62	-1.69	2.31	0.64	0.54		
qmof-8b9a87d	5.19	0.72	-2.03	2.76	0.66	0.8	yes	yes
qmof-6542f77	6.18	0.88	-1.53	2.41	0.57	0.84		
qmof-16de531	6.91	0.48	-2.33	2.81	0.63	0.63		

qmof-c4cc8a9	4.50	0.85	-2.12	2.97	0.63	0.56	yes	
qmof-bf9ccaf	5.29	0.52	-1.26	1.78	0.77	0.87	yes	yes
qmof-1cc623d	6.41	0.51	-2.23	2.75	0.57	0.92	yes	yes
qmof-918e13a	5.34	0.44	-2.18	2.62	0.74	0.82		yes
qmof-314b14f	4.84	0.41	-2.44	2.85	0.51	0.85	yes	yes
qmof-7269376	4.93	1.46	-1.03	2.49	0.85	0.61	yes	
qmof-b3220dc	4.60	0.35	-2.56	2.90	0.84	0.73		
qmof-db61142	4.94	1.03	-0.75	1.78	0.53	0.76	yes	
qmof-44fa197	4.53	0.60	-1.14	1.74	0.83	0.82		
qmof-9e05c25	6.73	0.40	-2.01	2.41	0.62	0.84		
qmof-1749614	5.48	0.14	-2.77	2.91	0.73	0.75	yes	
qmof-7d5de5b	5.08	1.45	-0.87	2.32	0.63	0.85	yes	
qmof-ef011df	5.90	2.05	-0.52	2.57	0.92	0.77	yes	
qmof-4d0c1e9	5.20	0.42	-2.31	2.72	0.57	0.83	yes	
qmof-b8bfbdd	6.08	0.82	-1.51	2.33	0.62	0.64		
qmof-e381eec	6.67	0.24	-2.38	2.62	0.66	0.89		
qmof-aaa921d	10.03	0.40	-2.41	2.82	0.57	0.86	yes	yes
qmof-277fc99	4.74	0.19	-1.94	2.14	0.64	0.75	yes	
qmof-84d13b7	5.78	0.64	-2.13	2.77	0.69	0.51		
qmof-28acf7f	4.51	0.59	-2.05	2.64	0.53	0.97		yes
qmof-8169402	5.63	0.61	-2.19	2.80	0.69	0.85	yes	
qmof-dbdc93d	6.84	0.21	-2.53	2.74	0.53	0.92	yes	yes
qmof-9314947	6.59	0.19	-2.66	2.85	0.71	0.87		yes
qmof-e6adc28	7.65	0.35	-2.03	2.38	0.78	0.91	yes	
qmof-ed987cc	6.66	0.86	-1.80	2.66	0.54	0.87	yes	yes
qmof-9ef6fed	5.59	0.15	-1.92	2.07	0.52	0.73		
qmof-68e1336	5.59	1.29	-1.35	2.64	0.94	0.95	yes	

qmof-17e43c6	4.90	1.11	-0.67	1.79	0.52	0.75	yes	
qmof-0f515e2	5.40	0.23	-2.28	2.50	0.63	0.95		yes
qmof-3ce4a78	4.83	0.19	-2.52	2.71	0.82	0.84		
qmof-25172f2	5.93	1.28	-1.70	2.98	0.56	0.77		
qmof-ba7bac6	9.52	0.72	-1.95	2.67	0.88	0.62	yes	
qmof-6a29cfc	6.77	0.13	-2.37	2.50	0.64	0.76		
qmof-f5056a0	15.68	0.43	-2.43	2.87	0.53	0.89		
qmof-7c0089b	5.66	1.13	-1.00	2.13	0.6	0.88	yes	
qmof-7964502	4.94	0.24	-2.67	2.91	0.84	0.84		
qmof-0180057	4.57	1.28	-0.52	1.79	0.69	0.55	yes	yes
qmof-bec2181	5.00	0.41	-2.57	2.98	0.54	0.85	yes	
qmof-8ec55e0	6.25	0.99	-1.67	2.66	0.6	0.84	yes	yes
qmof-d159ad9	4.52	0.92	-1.03	1.94	0.85	0.86		
qmof-55b32f8	6.23	0.50	-1.98	2.48	0.55	0.83	yes	yes
qmof-358ca87	7.16	0.40	-2.45	2.85	0.62	0.58		
qmof-49ea619	7.36	0.28	-2.47	2.75	0.64	0.84		
qmof-b80a30e	5.41	1.97	-0.30	2.26	0.76	0.87	yes	
qmof-648d493	4.92	1.05	-0.73	1.79	0.52	0.76	yes	
qmof-0a980e2	7.18	0.31	-2.53	2.84	0.61	0.88		
qmof-ca4b8ca	4.53	0.51	-2.07	2.58	0.84	0.74		
qmof-e99de19	4.90	1.11	-0.67	1.79	0.54	0.75	yes	yes
qmof-5ce2533	5.69	0.33	-2.33	2.65	0.57	0.82	yes	
qmof-24fb653	7.14	0.45	-1.83	2.28	0.73	0.82		
qmof-7163ed4	6.00	0.94	-1.96	2.90	0.63	0.6		
qmof-62058f7	8.98	0.68	-2.23	2.91	0.72	0.62	yes	
qmof-625c1df	6.09	0.38	-2.10	2.48	0.84	0.79	yes	
qmof-5b20bb3	6.44	0.62	-2.15	2.77	0.56	0.87	yes	yes

qmof-d77d3f0	11.25	0.29	-2.64	2.94	0.64	0.9	yes	
qmof-77442e8	4.78	0.16	-2.51	2.67	0.87	0.85		
qmof-523c57d	6.00	2.03	-0.17	2.20	0.71	0.85	yes	
qmof-18ceb78	7.19	0.35	-1.97	2.32	0.62	0.84		
qmof-a33f06a	4.75	0.60	-1.92	2.52	0.87	0.81		
qmof-b66eff0	7.05	0.35	-2.14	2.50	0.64	0.89		

Table S7: Passing MOF-shell materials for reduction to HCOOH.

qmof_id	PLD	CBM	VBM	Band Gap	Water Stability	Solvent Stability	Synthesized	OMS
HCOOH								
qmof-3b48e5d	6.90	0.10	-2.69	2.78	0.81	0.7	yes	
qmof-38471da	4.51	0.01	-2.15	2.16	0.68	0.62		yes
qmof-c3ad823	5.11	0.06	-2.66	2.72	0.66	0.63		yes
qmof-bd9ffd3	10.80	0.10	-2.71	2.81	0.63	0.77		
qmof-c3298fb	6.14	0.01	-2.91	2.92	0.7	0.7		yes
qmof-3a9ad54	5.37	0.08	-2.03	2.11	0.63	0.64		
qmof-60626cd	4.55	0.11	-2.21	2.32	0.9	0.59	yes	
qmof-fa2b07a	5.31	0.01	-2.64	2.65	0.76	0.79		
qmof-8325046	5.22	0.01	-1.95	1.96	0.56	0.7		yes
qmof-10b2259	6.16	0.02	-2.75	2.77	0.62	0.7		yes
qmof-912bab6	6.35	0.11	-2.51	2.62	0.56	0.62		
qmof-f62972b	5.36	0.11	-2.54	2.65	0.75	0.92		
qmof-0bbe221	4.98	0.03	-2.68	2.70	0.63	0.95		
qmof-beb185c	5.34	0.03	-2.37	2.40	0.73	0.56		yes
qmof-d192e8d	7.07	0.06	-1.80	1.86	0.76	0.84		
qmof-077f6af	5.40	0.04	-2.33	2.37	0.72	0.78		yes

Table S8: Passing MOF-shell materials for reduction to CH_4.

					CH4			
qmof_id	PLD	CBM	VBM	Band Gap	Water Stability	Solvent Stability	Synthesized	OMS
qmof-4aba306	6.21	-0.11	-3.04	2.93	0.61	0.86	yes	
qmof-0918da7	5.54	-0.13	-2.47	2.35	0.64	0.97		
qmof-a7d6d40	4.97	-0.07	-2.65	2.58	0.73	0.73		yes
qmof-7dfff4f	5.38	-0.14	-2.70	2.55	0.71	0.6		yes
qmof-53dfad5	6.20	-0.05	-2.37	2.32	0.63	0.76		yes
qmof-150e43b	7.66	-0.16	-2.61	2.45	0.61	0.8		
qmof-3e2b99e	5.14	-0.05	-2.67	2.62	0.74	0.8		yes
qmof-c906a20	5.94	-0.02	-2.55	2.53	0.59	0.59		yes
qmof-1ed0c50	4.93	-0.06	-2.76	2.71	0.73	0.89		
qmof-25d399e	21.78	-0.11	-3.02	2.92	0.54	0.94		
qmof-819df1b	5.15	-0.06	-2.89	2.84	0.77	0.73		yes
qmof-f48c59c	7.68	-0.01	-2.99	2.97	0.67	0.87		
qmof-1ad2593	5.51	-0.07	-2.79	2.72	0.75	0.8		yes
qmof-5108c60	5.96	-0.10	-2.25	2.16	0.64	0.73	yes	
qmof-56dbe2b	7.33	-0.13	-2.67	2.54	0.59	0.68		
qmof-5d740ae	4.93	-0.01	-2.58	2.57	0.53	0.81		yes
qmof-449a0d1	21.06	-0.02	-2.73	2.72	0.51	0.93		
qmof-502b122	5.89	-0.08	-2.44	2.36	0.7	0.55		yes
qmof-1c25053	5.48	-0.05	-2.11	2.07	0.62	0.72		
qmof-2531f43	7.81	-0.11	-2.38	2.26	0.77	0.66	yes	yes
qmof-0a464a7	5.30	-0.09	-2.51	2.42	0.76	0.71		yes
qmof-594c034	7.29	-0.03	-2.59	2.56	0.74	0.68		yes

qmof-6bab288	6.10	-0.04	-2.05	2.01	0.71	0.82		
qmof-5bd2003	6.91	-0.13	-2.60	2.47	0.63	0.74		
qmof-7c00823	5.49	-0.17	-3.12	2.95	0.51	0.56		
qmof-54d276d	6.02	-0.02	-2.40	2.38	0.71	0.75		yes
qmof-bafdee9	7.16	-0.12	-2.97	2.86	0.65	0.83		
qmof-91b0193	4.83	-0.16	-1.90	1.74	0.82	0.72	yes	
qmof-d3eb92f	5.39	-0.04	-2.84	2.80	0.75	0.64		yes
qmof-2e2337f	7.50	-0.09	-2.54	2.45	0.65	0.8		
qmof-13f8e19	7.65	-0.17	-2.05	1.88	0.61	0.78		
qmof-bbbed4f	4.69	-0.12	-2.95	2.83	0.81	0.7		
qmof-e5b19b5	6.20	-0.06	-3.04	2.98	0.77	0.62		yes
qmof-7e0c32f	8.75	-0.08	-2.52	2.44	0.59	0.82		
qmof-0475987	7.77	-0.12	-2.21	2.09	0.69	0.7		
qmof-c2f7da3	6.24	-0.06	-2.50	2.44	0.67	0.76	yes	yes
qmof-2e8198f	7.12	-0.15	-2.69	2.53	0.6	0.63		
qmof-ee62841	6.38	-0.01	-2.92	2.91	0.72	0.75		yes
qmof-525ab7b	4.72	-0.15	-3.05	2.89	0.63	0.63		
qmof-c921899	5.73	-0.08	-2.92	2.84	0.7	0.7		
qmof-00eae24	5.47	-0.04	-2.34	2.30	0.65	0.61		
qmof-b7e9d20	4.98	-0.01	-2.91	2.90	0.85	0.85		
qmof-35e0b44	5.70	-0.15	-2.31	2.15	0.71	0.65		
qmof-5a2471d	11.79	-0.09	-1.97	1.87	0.72	0.93	yes	yes
qmof-d292655	7.61	-0.10	-2.51	2.40	0.61	0.64		
qmof-bd7e00b	5.68	0.00	-2.41	2.40	0.71	0.51		