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A novel method to improve the gas storage capacity of ZIF-8

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Supplementary Information

Tables S1 to S5 show the different kinds of storage capacities, S_t, S_v, S_n, and S_{vc}, of wet ZIF-8 under the conditions suitable for hydrate formation. For comparison, the storage capacities of dry ZIF-8 were also given. The water contents of wet ZIF-8 are specified to 16.34%, 27.71%, 30.64%, and 35.13% (mass percentage), respectively. The temperatures were specified to 269.15 K and 274.15 K in order to see the difference in storing behaviors below ice point and above ice point. The initial pressures were specified to the values under which hydrate can form. P_1 is the equilibrium pressure when both adsorption and hydrate formation processes finished.

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Table S1 Methane storage capacities of dry ZIF-8 (x_w=0%)

P_1 (MPa)	S_t (mmol/g)	S_v* (V/V)	S_n (mmol/g)	S_{vc} (V/V)
		269.15 K		
2.837	8.922	69.946	5.954	123.290
4.084	11.217	87.942	6.773	140.258
5.254	13.440	105.366	7.513	155.563
6.129	14.807	116.090	7.710	159.648
7.212	16.745	131.281	8.132	168.393
8.202	18.757	147.057	8.702	180.204
9.165	20.941	164.177	9.446	195.591
10.127	22.822	178.927	9.863	204.238
11.227	25.283	198.219	10.644	220.404
		274.15 K		
3.032	8.195	64.250	5.081	105.205
4.114	10.544	82.665	6.182	128.015
5.167	12.597	98.759	6.953	143.968
6.212	14.565	114.187	7.581	156.990
7.297	16.356	128.227	7.919	163.979
8.207	18.072	141.688	8.374	173.412

9.240	19.740	154.763	8.576	177.579
10.157	21.305	167.029	8.817	182.583
11.205	23.314	182.780	9.309	192.765

*v_b=v_d=2.86 cm^3/g

Table S2 Methane storage capacities of wet ZIF-8 when x_w=16.34%

P_1 (MPa)	S_t (mmol/g)	S_v* (V/V)	S_n (mmol/g)	S_{vc} (V/V)
		269.15 K		
5.117	12.254	119.450	8.006	165.787
6.254	13.830	134.812	8.458	175.141
7.267	15.116	147.351	8.693	180.003
8.240	16.473	160.579	9.001	186.395
		274.15 K		
5.529	12.141	118.351	7.632	158.038
6.474	13.065	127.355	7.648	158.378
7.465	14.067	137.123	7.662	158.667
8.198	14.828	144.537	7.670	158.820

*v_b=2.30 cm^3/g

Table S3 Methane storage capacities of wet ZIF-8 when x_w=27.71%

P_1 (MPa)	S_t (mmol/g)	S_v * (V/V)	S_n (mmol/g)	S_{vc} (V/V)
		269.15 K		
5.046	13.250	123.266	9.114	185.561
6.080	14.945	137.661	9.310	192.788
7.182	16.334	150.454	9.465	195.989
8.185	17.640	162.485	9.602	198.823
9.157	18.822	173.375	9.618	199.153
10.127	20.005	184.268	9.618	199.156
		274.15 K		
5.139	13.026	119.987	8.530	176.627
6.324	14.309	131.807	8.594	177.953
7.260	15.515	142.912	8.794	182.098
8.202	16.646	153.332	8.879	183.857
9.195	17.942	165.263	9.044	187.279
10.175	19.078	175.733	9.049	187.380

* v_b=2.43 cm^3/g

Table S4 Methane storage capacities of wet ZIF-8 when x_w=30.64%

P_1 (MPa)	S_t (mmol/g)	S_v * (V/V)	S_n (mmol/g)	S_{vc} (V/V)
		269.15 K		
5.077	14.246	132.184	9.728	201.436
6.267	15.857	147.127	10.077	208.662
7.127	17.855	165.667	11.119	230.239
8.222	19.132	177.513	11.132	230.511
9.212	20.387	189.159	11.210	232.143
10.202	21.583	200.253	11.211	232.153
		274.15 K		
5.054	13.989	129.792	9.622	199.251
6.139	15.459	143.434	9.994	206.957
7.260	16.743	155.347	10.091	208.951
8.222	18.106	167.993	10.396	215.268
9.162	19.166	177.831	10.397	215.302
10.165	20.314	188.483	10.399	215.341

* v_b=2.41 cm^3/g

Table S5 Methane storage capacities of wet ZIF-8 when x_w=35.13%

P_1 (MPa)	S_t (mmol/g)	S_v * (V/V)	S_n (mmol/g)	S_{vc} (V/V)
		269.15 K		
2.867	12.154	99.019	9.303	192.630
3.907	13.895	113.207	9.881	204.600
5.132	15.658	127.571	10.181	210.816
6.132	17.062	139.010	10.318	213.660
7.120	18.376	149.711	10.321	213.723
8.137	19.798	161.303	10.340	214.122
9.125	21.202	172.738	10.342	214.154
		274.15 K		
5.049	15.212	123.936	9.991	206.880
6.039	16.610	135.326	10.192	211.047
7.140	18.001	146.660	10.193	211.060
8.212	19.444	158.412	10.227	211.767
9.185	20.760	169.137	10.232	211.872
10.085	21.997	179.214	10.237	211.978

* v_b=2.75 cm^3/g