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Electronic Supplementary Information (ESI)

Synthesis of sulphur-modified bifunctional hydrotalcites and study of their surface characteristics by inverse gas chromatography

Xiaoqian Ren,*[a] Xi Hu,[a] Feng Zhang,[a] Junge Wang,[a] Jinhua Liang,[b] Wenliang Wu,[a] Min Jiang[b] and Jun Wang[a]

[a]College of Chemistry and Chemical Engineering, [b]College of Biotechnology and Pharmaceutical Engineering, Nanjing Tech University, Jiangsu, 210009 Nanjing, China.

Tel: +8613951645412; E-mail: xqren@njtech.edu.cn (Dr. R. Xiaoqian)

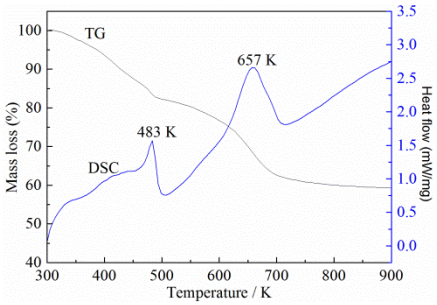

Fig.S1 The TG-DSC analysis of S/LDH-823 catalyst

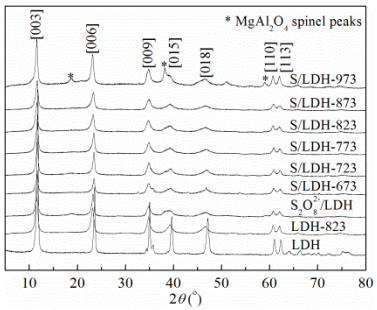

Fig.S2 The XRD patterns of the seven samples

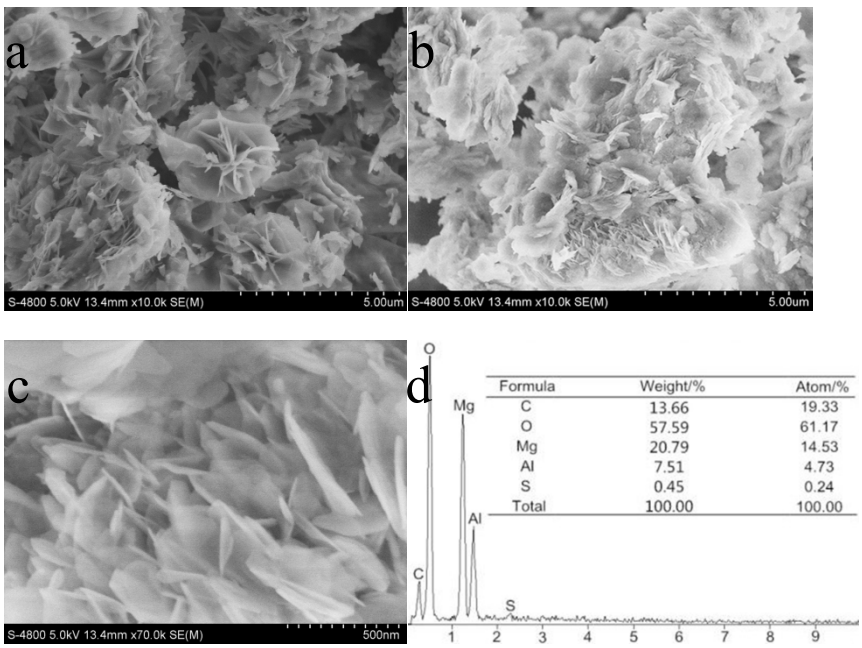

Fig.S3 (a) SEM images of LDH (b) SEM images of S/LDH-823 (c) Enlarged SEM images of S/LDH-823 (d) SEM-EDS spectrum of S/LDH-823

Table S1 The properties of probes used for IGC Measurements

Probe	Character	a×10^{20} / m^2	γ_l^d / mJ·m^{-2}	AN* / KJ·mol^{-1}	DN / KJ·mol^{-1}	$2aN(\gamma_l^d)^{0.5}$
n-hexane	apolar	0.515	18.4	--	--	2.6598
n-heptane	apolar	0.570	20.3	--	--	3.0921
n-octane	apolar	0.630	21.3	--	--	3.4896
n-nonane	apolar	0.690	22.7	--	--	3.9581
DCM	acidic	0.315	27.6	16.32	0.00	1.9925
TCM	acidic	0.440	25.9	22.60	0.00	2.6960
DEE	amphoteric	0.470	47.0	5.86	80.37	2.1916
THF	basic	0.450	22.5	2.09	83.72	2.5700
Acet	amphoteric	0.480	19.6	6.28	71.58	2.5586

*DCM-Dichloromethane; TCM-Chloroform; THF-Tetrahydrofuran; DEE-Diethylether; Acet-Ethylacetate.

*The corresponding donor and corrected acceptor numbers were taken from reference [1].

[1] F. L. Riddle and F. M. Fowkes, *J. Am. Chem. Soc.*, 1990, 112, 3259-3264.

LDH catalyst

Table S2 The retention time, V_n, and $RTlnV_n$ of LDH catalyst at various temperatures

Temperature	Probe	Retention time/min	V_n	$RTlnV_n$
	n-hexane	0.076	0.1017	-6.3318
	n-heptane	0.324	0.4334	-2.3155
	n-octane	1.096	1.4662	1.0600
	n-nonane	4.082	5.4609	4.7020
333.15 K	Dichloromethane(DCM)	0.020	0.0268	-10.0295
	Chloroform(TCM)	0.135	0.1806	-4.7404
	Diethylether(DEE)	0.012	0.0160	-11.4444
	Tetrahydrofuran(THF)	0.045	0.0602	-7.7834
	Ethylacetate(Acet)	0.057	0.0762	-7.1286
	n-hexane	0.056	0.0772	-7.3087
	n-heptane	0.193	0.2659	-3.7786
	n-octane	0.610	0.8405	-0.4956
	n-nonane	2.498	3.4421	3.5265
343.15 K	DCM	0.014	0.0193	-11.2637
	TCM	0.086	0.1185	-6.0848
	DEE	0.008	0.0110	-12.8603
	THF	0.030	0.0413	-9.0894
	Acet	0.038	0.0524	-8.4150
	n-hexane	0.037	0.0525	-8.6542
	n-heptane	0.140	0.1985	-4.7470
	n-octane	0.451	0.6396	-1.3123
	n-nonane	1.369	1.9414	1.9478
353.15 K	DCM	0.010	0.0142	-12.4956
	TCM	0.055	0.0780	-7.4902
	DEE	0.006	0.0085	-13.9954
	THF	0.021	0.0298	-10.3172
	Acet	0.026	0.0369	-9.6901
	n-hexane	0.023	0.0335	-10.2503
	n-heptane	0.091	0.1327	-6.0978
	n-octane	0.275	0.4010	-2.7588
	n-nonane	0.674	0.9829	-0.0522
363.15 K	DCM	0.007	0.0102	-13.8420
	TCM	0.033	0.0481	-9.1604
	DEE	0.004	0.0058	-15.5316
	THF	0.014	0.0204	-11.7492
	Acet	0.017	0.0248	-11.1630

333.15 K y=8.4914x-28.7420 R^2=0.9974

343.15 K y=8.3401x-29.5357 R^2=0.9998

353.15 K y=8.1975x-30.2423 R^2=0.9942

363.15 K y=7.8847x-30.8084 R^2=0.9801

Table S3 γ_s^d values of LDH catalyst versus temperature

	γ_s^d / mJ·m^{-2}			
Temperature / K	333.15 K	343.15 K	353.15 K	363.15 K
LDH	72.10	69.56	67.20	62.17

Table S4 Adsorption free energy and adsorption enthalpy of polar probes on the surface of LDH catalyst

	$-\Delta G^{SP}$ / KJ·mol^{-1}				$-\Delta H_a^s$ / KJ·mol^{-1}
Temperature / K	333.15 K	343.15 K	353.15 K	363.15 K	
CH_2Cl_2	1.7934	1.6544	1.4132	1.2561	7.9726(R^2=0.9895)
$CHCl_3$	1.1088	0.9660	0.6516	0.3908	9.3247(R^2=0.9744)
Diethyl ether	-1.3122	-1.6028	-1.7187	-2.0033	2.9666(R^2=0.9420)
THF	-0.8643	-0.9878	-1.1425	-1.2045	3.0660(R^2=0.9391)
Ethyl acetate	-0.1127	-0.2183	-0.4219	-0.5284	4.7289(R^2=0.9697)

y=0.0255x+0.4955(R^2=0.9270)

K_a=0.0255

K_b=0.4955

K_a+K_b=0.5210

K_a/K_b=0.0515

S/LDH-673 catalyst

Table S5 The retention time, V_n, and $RTlnV_n$ of S/LDH-673 catalyst at various temperatures

Temperature	Probe	Retention time/min	V_n	$RTlnV_n$
	n-hexane	0.079	0.1516	-5.2246
	n-heptane	0.234	0.6622	-1.1417
	n-octane	1.100	2.1114	2.0700
	n-nonane	3.747	7.1921	5.4648
333.15 K	DCM	0.097	0.1862	-4.6561
	TCM	0.316	0.6065	-1.3849
	DEE	0.030	0.0576	-7.9065
	THF	0.138	0.2649	-3.6796
	Acet	0.158	0.3033	-3.3048
	n-hexane	0.056	0.1107	-6.2788
	n-heptane	0.286	0.4626	-3.1991
	n-octane	0.752	1.4334	1.0271
	n-nonane	2.219	4.3870	4.2185
343.15 K	DCM	0.059	0.1166	-6.1299
	TCM	0.174	0.3440	-3.0444
	DEE	0.020	0.0395	-9.2162
	THF	0.090	0.1779	-4.9252
	Acet	0.092	0.1819	-4.8625
	n-hexane	0.042	0.0854	-7.2221
	n-heptane	0.154	0.3133	-3.4072
	n-octane	0.411	0.8362	-0.5251
	n-nonane	1.375	2.7976	3.0206
353.15 K	DCM	0.039	0.0794	-7.4396
	TCM	0.094	0.1913	-4.8567
	DEE	0.013	0.0264	-10.6653
	THF	0.057	0.1160	-6.3254
	Acet	0.056	0.1139	-6.3774
	n-hexane	0.025	0.0523	-8.9086
	n-heptane	0.083	0.1736	-5.2856
	n-octane	0.241	0.5042	-2.0673
	n-nonane	0.675	1.4123	1.0423
363.15 K	DCM	0.020	0.0418	-9.5823
	TCM	0.041	0.0858	-7.4150
	DEE	0.007	0.1465	-12.7520
	THF	0.030	0.0628	-8.3581
	Acet	0.029	0.0607	-8.4605

333.15 K y=8.2105x-26.8018 R^2=0.9941

343.15 K y=8.0765x-27.4596 R^2=0.9914

353.15 K y=7.8291x-27.8688 R^2=0.9972

363.15 K y=7.6938x-29.1935 R^2=0.9953

Table S6 γ_s^d values of S/LDH-673 catalyst versus temperature

γ_s^d / mJ·m^{-2}

Temperature / K	333.15 K	343.15 K	353.15 K	363.15 K
LDH	67.41	65.23	61.29	59.19

Table S7 Adsorption free energy and adsorption enthalpy of polar probes on the surface of S/LDH-673 catalyst

	$-\Delta G^{SP}$ / KJ·mol^{-1}				$-\Delta H_a^s$ / KJ·mol^{-1}
Temperature / K	333.15 K	343.15 K	353.15 K	363.15 K	
CH_2Cl_2	5.7862	5.2373	4.8297	4.2813	22.1723 (R^2=0.9971)
$CHCl_3$	3.2814	2.6410	1.9048	0.0054	28.1398 (R^2=0.9941)
Diethyl ether	0.9012	0.5429	0.0452	-0.4202	15.7577 (R^2=0.9935)
THF	2.0212	1.7778	1.4226	1.0623	12.7755 (R^2=0.9910)
Ethyl acetate	2.4896	1.9326	1.4599	1.0476	18.4971 (R^2=0.9944)

y=0.1195x+1.3123(0.9871)

K_a=0.1195

K_b=1.3123

K_a+K_b=1.4318

K_a/K_b=0.0911

S/LDH-723 catalyst

Table S8 The retention time, V_n, and $RTlnV_n$ of S/LDH-723 catalyst at various temperatures

Temperature	Probe	Retention time/min	V_n	$RTlnV_n$
	n-hexane	0.107	0.2054	-4.3843
	n-heptane	0.301	0.5777	-1.5196
	n-octane	0.819	1.5720	1.2529
	n-nonane	2.864	5.4627	4.7030
333.15 K	DCM	0.203	0.3896	-2.6106
	TCM	0.583	1.1190	0.3115
	DEE	0.060	0.1152	-5.9866
	THF	0.219	0.4204	-2.4005
	Acet	0.274	0.5259	-1.7799
	n-hexane	0.090	0.1779	-4.9252
	n-heptane	0.239	0.4725	-2.1388
	n-octane	0.618	1.2218	0.5716
	n-nonane	2.044	4.0411	3.9842
343.15 K	DCM	0.137	0.2708	-3.7264
	TCM	0.403	0.7968	-0.6482
	DEE	0.042	0.0830	-7.0995
	THF	0.143	0.2827	-3.6042
	Acet	0.169	0.3341	-3.1276
	n-hexane	0.067	0.1363	-5.8508
	n-heptane	0.164	0.3337	-3.2225
	n-octane	0.425	0.8647	-0.4267
	n-nonane	1.225	2.4924	2.6814
353.15 K	DCM	0.089	0.1811	-5.0172
	TCM	0.257	0.5229	-1.9036
	DEE	0.029	0.0590	-8.3095
	THF	0.094	0.1913	-4.8567
	Acet	0.105	0.2136	-4.5318
	n-hexane	0.053	0.1109	-6.6399
	n-heptane	0.126	0.2636	-4.0253
	n-octane	0.280	0.5858	-1.6144
	n-nonane	0.842	1.7617	1.7097
363.15 K	DCM	0.059	0.1234	-6.3161
	TCM	0.167	0.3494	-3.1748
	DEE	0.019	0.0398	-9.7372
	THF	0.066	0.1381	-5.9776
	Acet	0.067	0.1402	-5.9322

333.15 K y=7.0005x-23.0881 R^2=0.9991

343.15 K y=6.8623x-23.2720 R^2=0.9988

353.15 K y=6.6138x-23.5294 R^2=0.9989

363.15 K y=6.4045x-23.7767 R^2=0.9974

Table S9 γ_s^d values of S/LDH-723 catalyst versus temperature

	γ_s^d / mJ·m^{-2}			
Temperature / K	333.15 K	343.15 K	353.15 K	363.15K

S/LDH-450	49.01	47.09	43.74	41.02

Table S10 Adsorption free energy and adsorption enthalpy of polar probes on the surface of S/LDH-723 catalyst

	$-\Delta G^{SP}$ / KJ·mol^{-1}				$-\Delta H_a^S$ / KJ·mol^{-1}
Temperature / K	333.15 K	343.15 K	353.15 K	363.15 K	
CH_2Cl_2	6.5290	5.8725	5.3342	4.6996	26.6000 (R^2=0.9987)
$CHCl_3$	4.8572	4.1159	3.1597	2.4121	32.4984 (R^2=0.9969)
Diethyl ether	1.7592	1.1331	0.7251	0.0034	20.6286 (R^2=0.9865)
THF	2.6963	2.0317	1.6752	1.3395	17.4809 (R^2=0.9630)
Ethyl acetate	3.3967	2.5865	2.0755	1.4579	24.4871 (R^2=0.9891)

y=0.1696x+1.5590(0.9864)

K_a=0.1696

K_b=1.5590

K_a+K_b=1.7286

K_a/K_b=0.1088

S/LDH-773 catalyst

Table S11 The retention time, V_n, and $RTlnV_n$ of S/LDH-773 catalyst at various temperatures

Temperature	Probe	Retention time/min	V_n	$RTlnV_n$

	n-hexane	0.084	0.1472	-5.3071
	n-heptane	0.234	0.4100	-2.4694
	n-octane	0.609	1.0671	0.1799
	n-nonane	1.575	2.7598	2.8118
333.15 K	DCM	0.291	0.5099	-1.8656
	TCM	0.684	1.1985	0.5016
	DEE	0.090	0.1577	-5.1160
	THF	0.317	0.5555	-1.6286
	Acet	0.429	0.7517	-0.7905
	n-hexane	0.059	0.1065	-6.3899
	n-heptane	0.150	0.2707	-3.7278
	n-octane	0.359	0.6479	-1.2381
	n-nonane	0.938	1.6929	1.5020
343.15 K	DCM	0.163	0.2942	-3.4907
	TCM	0.298	0.5378	-1.7694
	DEE	0.050	0.0902	-6.8621
	THF	0.169	0.3050	-3.3876
	Acet	0.191	0.3447	-3.0384
	n-hexane	0.043	0.07987	-7.4206
	n-heptane	0.100	0.1857	-4.9426
	n-octane	0.242	0.4495	-2.3478
	n-nonane	0.567	1.0532	0.1521
353.15 K	DCM	0.094	0.1746	-5.1243
	TCM	0.150	0.2786	-3.7521
	DEE	0.028	0.0520	-8.6801
	THF	0.090	0.1672	-5.2520
	Acet	0.101	0.1876	-4.9134
	n-hexane	0.039	0.0745	-7.8412
	n-heptane	0.084	0.1604	-5.5247
	n-octane	0.192	0.3667	-3.0287
	n-nonane	0.450	0.8595	-0.4571
363.15 K	DCM	0.068	0.1299	-6.1627
	TCM	0.091	0.1738	-5.2830
	DEE	0.019	0.0363	-10.0124
	THF	0.062	0.1184	-6.4416
	Acet	0.064	0.1222	-6.3457
333.15 K y=6.2845x-21.9344 R^2=0.9976				
343.15 K y=6.0931x-22.5700 R^2=0.9997				
353.15 K y=5.8905x-23.0777 R^2=0.9979				
363.15 K y=5.7387x-23.1500 R^2=0.9987				

Table S12 γ_s^d values of S/LDH-773 catalyst versus temperature

	γ_s^d / mJ·m^{-2}			
Temperature / K	333.15 K	343.15 K	353.15 K	363.15 K
S/LDH-450	39.49	37.12	34.70	32.93

Table S13 Adsorption free energy and adsorption enthalpy of polar probes on the surface of S/LDH-773 catalyst

	$-\Delta G^{SP}$ / KJ·mol^{-1}				$-\Delta H_a^s$ / KJ·mol^{-1}
Temperature / K	333.15K	343.15K	353.15K	363.15K	
CH_2Cl_2	7.5469	6.9388	6.2167	5.5529	29.8810 (R^2=0.9990)
$CHCl_3$	5.4930	4.3736	3.4448	2.3955	39.5418 (R^2=0.9986)
Diethyl ether	3.0453	2.3543	1.4880	0.5607	30.7334 (R^2=0.9943)
THF	4.1546	3.5231	2.6871	1.9599	28.8744 (R^2=0.9968)
Ethyl acetate	5.0644	3.9418	3.0929	2.1213	37.3122 (R^2=0.9964)

y=0.3107x+1.7619(0.9869)

K_a=0.3107

K_b=1.7619

K_a+K_b=2.0726

K_a/K_b=0.1734

S/LDH-823 catalyst

Table S14 The retention time, V_n, and $RTlnV_n$ of S/LDH-823 catalyst at various temperatures

Temperature	Probe	Retention time/min	V_n	$RTlnV_n$
333.15 K	n-hexane	0.100	0.1841	-4.6870

	n-heptane	0.250	0.4603	-2.1490
	n-octane	0.567	1.0440	0.1191
	n-nonane	1.389	2.5574	2.6008
	DCM	0.615	1.1323	0.3442
	TCM	1.017	1.8725	1.7374
	DEE	0.229	0.4216	-2.3921
	THF	0.524	0.9648	-0.0993
	Acet	0.701	1.2907	0.7068
	n-hexane	0.091	0.1726	-5.0124
	n-heptane	0.196	0.3717	-2.8234
	n-octane	0.416	0.7889	-0.6764
	n-nonane	1.000	1.8964	1.8258
343.15 K	DCM	0.450	0.8534	-0.4523
	TCM	0.585	1.1094	0.2962
	DEE	0.152	0.2883	-3.5488
	THF	0.318	0.6031	-1.4428
	Acet	0.384	0.7282	-0.9048
	n-hexane	0.076	0.1483	-5.6030
	n-heptane	0.143	0.2791	-3.7470
	n-octane	0.286	0.5582	-1.7119
	n-nonane	0.618	1.2062	0.5503
353.15 K	DCM	0.309	0.6031	-1.4848
	TCM	0.321	0.6265	-1.3729
	DEE	0.098	0.1913	-4.8565
	THF	0.190	0.3708	-2.9127
	Acet	0.210	0.4099	-2.6188
	n-hexane	0.068	0.1365	-6.0131
	n-heptane	0.118	0.2368	-4.3490
	n-octane	0.207	0.4154	-2.6521
	n-nonane	0.422	0.8470	-0.5016
363.15 K	DCM	0.230	0.4616	-2.3340
	TCM	0.192	0.3853	-2.8792
	DEE	0.067	0.1345	-6.0579
	THF	0.123	0.2469	-4.2237
	Acet	0.131	0.2629	-4.0335

333.15 K y=5.6187x-19.5702 R^2=0.9991

343.15 K y=5.2797x-19.0942 R^2=0.9997

353.15 K y=4.7744x-18.3829 R^2=0.9983

363.15 K y=4.2505x-17.4051 R^2=0.9975

Table S15 γ_s^d values of S/LDH-823 catalyst versus temperature

	γ_s^d / mJ·m^{-2}			
Temperature / K	333.15 K	343.15 K	353.15 K	363.15 K
S/LDH-450	31.57	27.88	22.79	18.07

Table S16 Adsorption free energy and adsorption enthalpy of polar probes on the surface of S/LDH-823 catalyst

	$-\Delta G^{SP}$ / KJ·mol^{-1}				$-\Delta H_a^S$ / KJ·mol^{-1}
Temperature / K	333.15K	343.15K	353.15K	363.15K	
CH_2Cl_2	8.7191	8.1221	7.3851	6.6020	32.3101 (R^2=0.9968)
$CHCl_3$	6.1596	5.1563	4.1382	3.0666	40.4524 (R^2=0.9997)
Diethyl ether	4.8601	3.9744	3.0628	2.0318	36.1386 (R^2=0.9984)
THF	5.0308	4.0826	3.2000	2.2576	35.6832 (R^2=0.9998)
Ethyl acetate	5.9010	4.6808	3.5483	2.4963	37.7271 (R^2=0.9987)

y=0.3774x+1.8747(0.9877)

K_a=0.3774

K_b=1.8747

K_a+K_b=2.2521

K_a/K_b=0.2013

S/LDH-873 catalyst

Table S17 The retention time, V_n, and $RTlnV_n$ of S/LDH-873 catalyst at various temperatures

Temperature	Probe	Retention time/min	V_n	$RTlnV_n$
333.15 K	n-hexane	0.153	0.2611	-3.7193
	n-heptane	0.391	0.6673	-1.1205

	n-octane	0.875	1.4933	1.1106
	n-nonane	1.957	3.3398	3.3402
	DCM	0.819	1.3977	0.9274
	TCM	1.442	2.4609	2.4943
	DEE	0.225	0.3840	-2.6511
	THF	0.712	1.2151	0.5396
	Acet	0.917	1.5650	1.2405
343.15 K	n-hexane	0.094	0.1652	-5.1364
	n-heptane	0.224	0.3938	-2.6590
	n-octane	0.444	0.7805	-0.7071
	n-nonane	0.908	1.5961	1.3340
	DCM	0.463	0.8139	-0.5876
	TCM	0.568	0.9984	-0.0044
	DEE	0.115	0.2022	-4.5611
	THF	0.315	0.5537	-1.6864
	Acet	0.381	0.6697	-1.1437
353.15 K	n-hexane	0.052	0.0941	-6.9400
	n-heptane	0.113	0.2044	-4.6612
	n-octane	0.225	0.4070	-2.6391
	n-nonane	0.410	0.7417	-0.8773
	DCM	0.189	0.3419	-3.1510
	TCM	0.212	0.3835	-2.8138
	DEE	0.047	0.0850	-7.2369
	THF	0.129	0.2334	-4.2724
	Acet	0.138	0.2496	-4.0744
363.15 K	n-hexane	0.030	0.0558	-8.7130
	n-heptane	0.055	0.1023	-6.8829
	n-octane	0.095	0.1767	-5.2328
	n-nonane	0.175	0.3256	-3.3883
	DCM	0.095	0.1767	-5.2328
	TCM	0.081	0.1509	-5.7141
	DEE	0.021	0.0391	-9.7898
	THF	0.054	0.1004	-6.9383
	Acet	0.055	0.1023	-6.8829
333.15 K y=5.4470x-18.0717 R^2=0.9955				
343.15 K y=4.9714x-18.1973 R^2=0.9938				
353.15 K y=4.6987x-19.2848 R^2=0.9904				
363.15 K y=4.1042x-19.5978 R^2=0.9996				

Table S18 γ_s^d values of S/LDH-873 catalyst versus temperature

	γ_s^d / mJ·m^{-2}			
Temperature / K	333.15 K	343.15 K	353.15 K	363.15 K
S/LDH-450	29.67	24.71	22.08	16.84

Table S19 Adsorption free energy and adsorption enthalpy of polar probes on the surface of S/LDH-873 catalyst

	$-\Delta G^{SP}$ / KJ·mol^{-1}				$-\Delta H_a^S$ / KJ·mol^{-1}
Temperature / K	333.15K	343.15K	353.15K	363.15K	
CH_2Cl_2	8.1460	7.7042	6.7716	6.1874	30.8445 (R^2=0.9844)
$CHCl_3$	5.8809	4.7900	3.8033	2.8188	39.7836 (R^2=0.9992)
Diethyl ether	3.4830	2.7409	1.7502	0.8132	33.4512 (R^2=0.9953)
THF	4.6125	3.7344	2.9367	2.1117	32.2674 (R^2=0.9995)
Ethyl acetate	5.3755	4.3338	3.1883	2.2139	40.8128 (R^2=0.9990)

y=0.3381x+1.8519(0.9865)

K_a=0.3381

K_b=1.8519

K_a+K_b=2.1900

K_a/K_b=0.1826

LDH-823 catalyst

Table S20 The retention time, V_n, and $RTlnV_n$ of LDH-823 catalyst at various temperatures

Temperature	Probe	Retention time/min	V_n	$RTlnV_n$
333.15 K	n-hexane	0.147	0.2604	-3.7262
	n-heptane	0.428	0.7583	-0.7662
	n-octane	1.025	1.8161	1.6528

	n-nonane	3.077	5.4519	4.6975
	DCM	0.951	1.6850	1.4452
	TCM	1.612	2.8562	2.9069
	DEE	0.043	0.0762	-7.1310
	THF	0.154	0.2729	-3.5974
	Acet	0.190	0.3366	-3.0156
	n-hexane	0.090	0.1642	-5.1534
	n-heptane	0.228	0.4161	-2.5015
	n-octane	0.556	1.0147	0.0416
	n-nonane	1.478	2.6974	2.8309
343.15 K	DCM	0.470	0.8578	-0.4378
	TCM	0.794	1.4490	1.0582
	DEE	0.024	0.0438	-8.9244
	THF	0.090	0.1642	-5.1534
	Acet	0.097	0.1770	-4.9398
	n-hexane	0.054	0.1014	-6.7191
	n-heptane	0.124	0.2329	-4.2784
	n-octane	0.274	0.5146	-1.9505
	n-nonane	0.717	1.3467	0.8739
353.15 K	DCM	0.217	0.4076	-2.6353
	TCM	0.268	0.5034	-2.0155
	DEE	0.012	0.02254	-11.4352
	THF	0.048	0.0902	-7.0649
	Acet	0.050	0.0939	-6.9451
	n-hexane	0.035	0.0676	-8.1343
	n-heptane	0.076	0.1468	-5.7933
	n-octane	0.162	0.3129	-3.5081
	n-nonane	0.379	0.7320	-0.9420
363.15 K	DCM	0.099	0.1912	-4.9950
	TCM	0.102	0.1970	-4.9049
	DEE	0.008	0.0154	-12.5904
	THF	0.029	0.0560	-8.7021
	Acet	0.027	0.0521	-8.9178

333.15 K y=6.4523x-20.8274 R^2=0.9993

343.15 K y=6.1702x-21.5567 R^2=0.9997

353.15 K y=5.8508x-22.3255 R^2=0.9996

363.15 K y=5.5579x-22.9351 R^2=0.9998

Table S21 γ_s^d values of LDH-823 catalyst versus temperature

	γ_s^d / mJ·m^{-2}			
Temperature / K	333.15 K	343.15 K	353.15 K	363.15 K
S/LDH-450	41.63	38.07	34.23	30.89

Table S22 Adsorption free energy and adsorption enthalpy of polar probes on the surface of LDH-823 catalyst

	$-\Delta G^{SP}$ / KJ·mol^{-1}		$-\Delta H_a^s$ / KJ·mol^{-1}

Temperature / K	333.15K	343.15K	353.15K	363.15K	
CH_2Cl_2	9.4164	8.8248	8.0325	6.8660	37.4520 (R^2=0.9788)
$CHCl_3$	6.3389	5.9800	4.5362	3.0461	43.9359 (R^2=0.9312)
Diethyl ether	-0.4445	-0.8903	-1.6323	-1.8360	16.0085 (R^2=0.9354)
THF	0.6476	0.5459	0.2240	-0.0508	8.6862 (R^2=0.9469)
Ethyl acetate	1.3030	0.8298	0.4105	-0.2031	17.7204 (R^2=0.9650)

y=0.0508x+2.1227(0.9558)

K_a=0.0508

K_b=2.1227

K_a+K_b=2.1735

K_a/K_b=0.0239

Table S23 γ_s^d values of these catalysts versus temperature

	γ_s^d / mJ·m^{-2}			
Temperature / K	333.15 K	343.15 K	353.15 K	363.15 K
LDH	72.10	69.56	67.20	62.17
LDH-823	42.06	38.07	34.13	30.95
S/LDH-673	67.41	65.23	61.29	59.19
S/LDH-723	49.01	47.09	43.74	41.02
S/LDH-773	39.49	37.12	34.70	32.93
S/LDH-823	31.57	27.88	22.79	18.07
S/LDH-873	29.67	24.71	22.08	16.84