无 Cu^{2+}		有 Cu^{2+}		$V(NaOH)c(NaOH)=2V_L c_L$
V(NaOH)/mL	pH	V(NaOH)/mL	pH	解得 $c_L=0.97226M$
0.00	1.95	0.00	1.95	
2.00	2.12	2.00	2.12	
4.00	2.35	4.00	2.35	
6.00	2.70	6.00	2.68	
7.00	2.97	7.00	2.93	
8.00	3.46	8.00	3.34	
8.50	4.44	8.50	3.71	
8.54	4.94	8.88	4.18	
8.60	5.99	8.97	4.31	
8.65	7.10	9.30	4.85	
8.68	8.87	9.50	5.52	
8.74	9.64	9.55	5.89	
8.80	9.84	9.60	6.09	
8.85	10.01	9.65	6.27	
8.90	10.13	9.75	6.64	
8.93	10.23	9.90	6.94	
9.00	10.34	10.11	7.30	
9.51	10.85	10.35	7.92	
9.99	11.06	10.50	8.65	
11.00	11.34	10.54	9.00	
12.00	11.51	10.60	9.39	
		10.63	9.64	
		10.68	9.83	
		10.70	9.98	
		10.75	10.13	
		10.81	10.26	
		10.85	10.36	
		11.00	10.55	
		11.24	10.80	
		11.50	10.95	
		12.00	11.16	
		13.00	11.42	

pH	V1	V2	V2-V1	V 总	[L]配	$\overline{n}$
2.55	4.62500	4.75000	0.12500	54.75000	2.56621E-04	0.13523
2.75	5.78125	6.06250	0.28125	56.06250	5.63880E-04	0.30426
2.95	6.56250	6.87500	0.31250	56.87500	6.17582E-04	0.33807
3.15	7.18750	7.37500	0.18750	57.37500	3.67320E-04	0.20284
3.35	7.67969	7.84375	0.16406	57.84375	3.18801E-04	0.17748
3.55	7.89063	8.18750	0.29688	58.18750	5.73469E-04	0.32116
3.75	8.07031	8.43000	0.35969	58.43000	6.91920E-04	0.38911
3.95	8.21875	8.64250	0.42375	58.64250	8.12201E-04	0.45842
4.15	8.33656	8.81438	0.47781	58.81438	9.13146E-04	0.51690
4.35	8.42563	8.93625	0.51062	58.93625	9.73836E-04	0.55240
4.55	8.48594	9.09375	0.60781	59.09375	1.15610E-03	0.65754
4.75	8.51750	9.25063	0.73312	59.25063	1.39076E-03	0.79310
4.95	8.53344	9.31688	0.78344	59.31688	1.48454E-03	0.84753
5.15	8.54563	9.37500	0.82938	59.37500	1.57005E-03	0.89723
5.35	8.55906	9.42500	0.86594	59.42500	1.63789E-03	0.93678
5.55	8.57375	9.49688	0.92312	59.49688	1.74394E-03	0.99865
5.75	8.58109	9.51875	0.93766	59.51875	1.77075E-03	1.01437
5.95	8.59531	9.55625	0.96094	59.55625	1.81357E-03	1.03955
6.15	8.60219	9.59375	0.99156	59.59375	1.87019E-03	1.07268
6.35	8.61547	9.64688	1.03141	59.64688	1.94361E-03	1.11579
6.55	8.62188	9.71250	1.09063	59.71250	2.05294E-03	1.17985
6.75	8.63406	9.77188	1.13781	59.77188	2.13964E-03	1.23090
6.95	8.63969	9.88500	1.24531	59.88500	2.33737E-03	1.34719
7.15	8.64500	9.97875	1.33375	59.97875	2.49944E-03	1.44286
7.35	8.65000	10.08563	1.43563	60.08563	2.68557E-03	1.55307
7.55	8.65469	10.20000	1.54531	60.20000	2.88527E-03	1.67173
7.75	8.65906	10.26000	1.60094	60.26000	2.98615E-03	1.73191
7.95	8.66313	10.36313	1.70000	60.36313	3.16551E-03	1.83908
8.15	8.66688	10.40625	1.73938	60.40625	3.23652E-03	1.88167
8.35	8.67109	10.44375	1.77266	60.44375	3.29640E-03	1.91768
8.55	8.67578	10.47438	1.79859	60.47438	3.34294E-03	1.94574
8.75	8.68094	10.49813	1.81719	60.49813	3.37617E-03	1.96585
8.95	8.69266	10.52500	1.83234	60.52500	3.40282E-03	1.98225
9.15	8.69922	10.54875	1.84953	60.54875	3.43339E-03	2.00084
9.35	8.71375	10.59063	1.87688	60.59063	3.48174E-03	2.03042
9.55	8.72875	10.61125	1.88250	60.61125	3.49099E-03	2.03651
9.75	8.75125	10.63750	1.88625	60.63750	3.49643E-03	2.04056
9.95	8.80891	10.68750	1.87859	60.68750	3.47936E-03	2.03228
10.15	8.87188	10.73125	1.85938	60.73125	3.44129E-03	2.01149
10.35	8.94500	10.81375	1.86875	60.81375	3.45395E-03	2.02163
10.55	9.11625	10.94375	1.82750	60.94375	3.37050E-03	1.97701
10.75	9.35016	11.15000	1.79984	61.15000	3.30830E-03	1.94709
10.95	9.59859	11.33750	1.73891	61.33750	3.18652E-03	1.88117
11.15	10.00969	11.81250	1.80281	61.81250	3.27824E-03	1.95030
11.35	10.68422	12.37500	1.69078	62.37500	3.04679E-03	1.82910

pH	V_2-V_1	$V_总$	$[L]_配$	$[H^+]$	$\alpha_{L(H)}$	$lg\alpha_{L(H)}$	$[L^{3-}]$	$lg[L^{3-}]$
2.55	0.12500	54.75000	2.56621E-04	2.81838E-03	2.38094E+09	9.37675	1.38391E-12	-11.85889
2.75	0.28125	56.06250	5.63880E-04	1.77828E-03	1.20913E+09	9.08247	2.40222E-12	-11.61939
2.95	0.31250	56.87500	6.17582E-04	1.12202E-03	6.46210E+08	8.81037	4.33505E-12	-11.36301
3.15	0.18750	57.37500	3.67320E-04	7.07946E-04	3.61271E+08	8.55783	8.36441E-12	-11.07756
3.35	0.16406	57.84375	3.18801E-04	4.46684E-04	2.09451E+08	8.32108	1.45279E-11	-10.83780
3.55	0.29688	58.18750	5.73469E-04	2.81838E-04	1.24791E+08	8.09618	2.21839E-11	-10.65396
3.75	0.35969	58.43000	6.91920E-04	1.77828E-04	7.58065E+07	7.87971	3.47731E-11	-10.45876
3.95	0.42375	58.64250	8.12201E-04	1.12202E-04	4.66636E+07	7.66898	5.36539E-11	-10.27040
4.15	0.47781	58.81438	9.13146E-04	7.07946E-05	2.89782E+07	7.46207	8.25812E-11	-10.08312
4.35	0.51062	58.93625	9.73836E-04	4.46684E-05	1.80990E+07	7.25766	1.28489E-10	-9.89113
4.55	0.60781	59.09375	1.15610E-03	2.81838E-05	1.13461E+07	7.05485	1.88124E-10	-9.72556
4.75	0.73312	59.25063	1.39076E-03	1.77828E-05	7.12958E+06	6.85306	2.65247E-10	-9.57635
4.95	0.78344	59.31688	1.48454E-03	1.12202E-05	4.48679E+06	6.65194	3.99762E-10	-9.39820
5.15	0.82938	59.37500	1.57005E-03	7.07946E-06	2.82633E+06	6.45122	6.03232E-10	-9.21952
5.35	0.86594	59.42500	1.63789E-03	4.46684E-06	1.78144E+06	6.25077	9.17425E-10	-9.03743
5.55	0.92312	59.49688	1.74394E-03	2.81838E-06	1.12328E+06	6.05049	1.35703E-09	-8.86741
5.75	0.93766	59.51875	1.77075E-03	1.77828E-06	7.08448E+05	5.85031	2.11212E-09	-8.67528
5.95	0.96094	59.55625	1.81357E-03	1.12202E-06	4.46884E+05	5.65019	3.24792E-09	-8.48839
6.15	0.99156	59.59375	1.87019E-03	7.07946E-07	2.81919E+05	5.45012	4.94032E-09	-8.30624
6.35	1.03141	59.64688	1.94361E-03	4.46684E-07	1.77861E+05	5.25008	7.40157E-09	-8.13068
6.55	1.09063	59.71250	2.05294E-03	2.81838E-07	1.12215E+05	5.05005	1.07252E-08	-7.96960
6.75	1.13781	59.77188	2.13964E-03	1.77828E-07	7.08006E+04	4.85004	1.57287E-08	-7.80331
6.95	1.24531	59.88500	2.33737E-03	1.12202E-07	4.46714E+04	4.65003	2.03648E-08	-7.69112
7.15	1.33375	59.97875	2.49944E-03	7.07946E-08	2.81856E+04	4.45003	2.63457E-08	-7.57929
7.35	1.43563	60.08563	2.68557E-03	4.46684E-08	1.77841E+04	4.25003	3.09645E-08	-7.50914
7.55	1.54531	60.20000	2.88527E-03	2.81838E-08	1.12213E+04	4.05004	3.07301E-08	-7.51244
7.75	1.60094	60.26000	2.98615E-03	1.77828E-08	7.08051E+03	3.85006	3.39995E-08	-7.46853
7.95	1.70000	60.36313	3.16551E-03	1.12202E-08	4.46786E+03	3.65010	1.25031E-08	-7.90298
8.15	1.73938	60.40625	3.23652E-03	7.07946E-09	2.81939E+03	3.45016	-6.18729E-09	-8.20850
8.35	1.77266	60.44375	3.29640E-03	4.46684E-09	1.77928E+03	3.25024	-4.45813E-08	-7.35085
8.55	1.79859	60.47438	3.34294E-03	2.81838E-09	1.12302E+03	3.05039	-1.13525E-07	-6.94491
8.75	1.81719	60.49813	3.37617E-03	1.77828E-09	7.08946E+02	2.85061	-2.28489E-07	-6.64113
8.95	1.83234	60.52500	3.40282E-03	1.12202E-09	4.47684E+02	2.65097	-4.24543E-07	-6.37208
9.15	1.84953	60.54875	3.43339E-03	7.07946E-10	2.82838E+02	2.45154	-7.84520E-07	-6.10540
9.35	1.87688	60.59063	3.48174E-03	4.46684E-10	1.78828E+02	2.25244	-1.52361E-06	-5.81713
9.55	1.88250	60.61125	3.49099E-03	2.81838E-10	1.13202E+02	2.05385	-2.49821E-06	-5.60237
9.75	1.88625	60.63750	3.49643E-03	1.77828E-10	7.17946E+01	1.85609	-4.03416E-06	-5.39425
9.95	1.87859	60.68750	3.47936E-03	1.12202E-10	4.56684E+01	1.65962	-6.02632E-06	-5.21995
10.15	1.85938	60.73125	3.44129E-03	7.07946E-11	2.91838E+01	1.46514	-8.20469E-06	-5.08594
10.35	1.86875	60.81375	3.45395E-03	4.46684E-11	1.87828E+01	1.27376	-1.36533E-05	-4.86476
10.55	1.82750	60.94375	3.37050E-03	2.81838E-11	1.22202E+01	1.08708	-1.47151E-05	-4.83224
10.75	1.79984	61.15000	3.30830E-03	1.77828E-11	8.07946E+00	0.90738	-1.58897E-05	-4.79888
10.95	1.73891	61.33750	3.18652E-03	1.12202E-11	5.46684E+00	0.73774	-2.98538E-06	-5.52500
11.15	1.80281	61.81250	3.27824E-03	7.07946E-12	3.81838E+00	0.58188	-3.46750E-05	-4.45998
11.35	1.69078	62.37500	3.04679E-03	4.46684E-12	2.77828E+00	0.44378	2.54375E-05	-4.59453

根据以上数据作图如下：
滴定曲线：
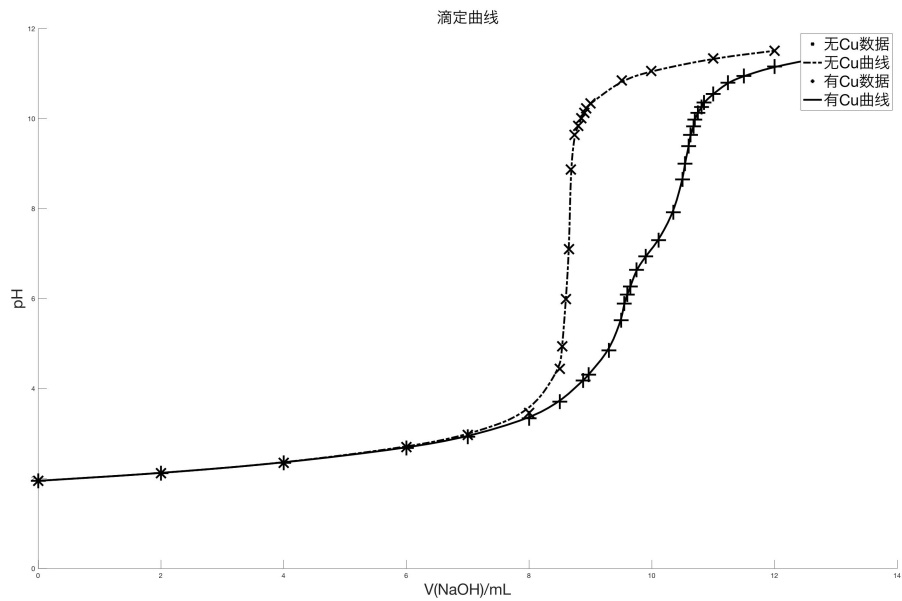
滴定曲线

滴定曲线一阶导数：

滴定曲线
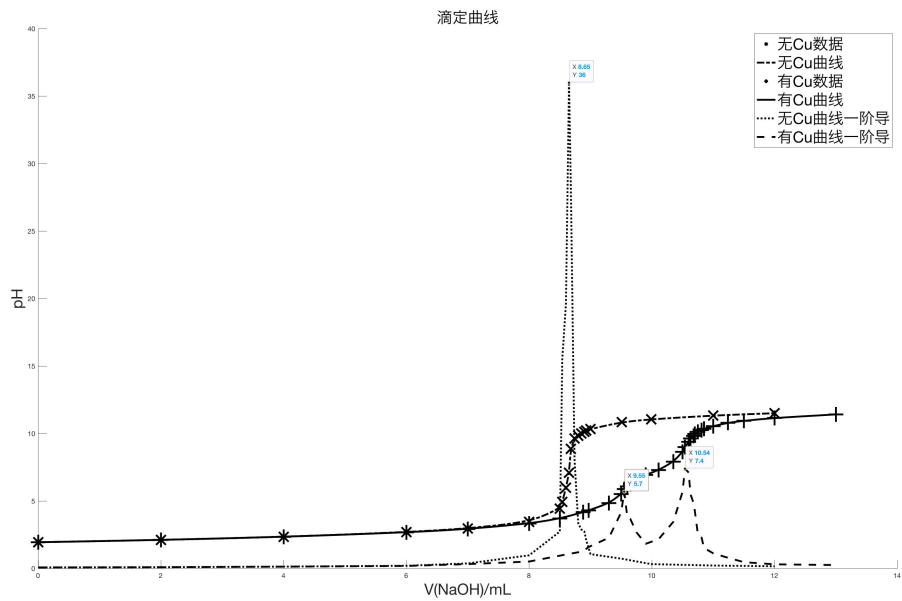
终点 pH=8.65，9.55，10.54

$\overline{n} - \left(-\lg\left[L^{3-}\right]\right)_{\text{图}}$
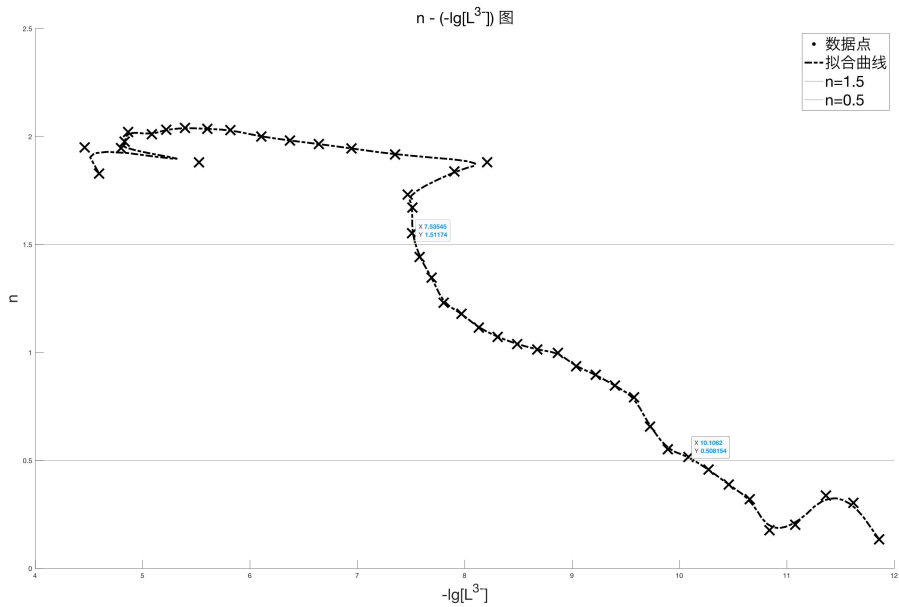
n=1.5,   -lg[L³⁻]=7.53545=lgK₂,   K₂=10^7.53545=3.43 × 10^7
n=0.5,   -lg[L³⁻]=10.1062=lgK₁,   K₁=10^10.1062=1.27 × 10^10