Supporting Information (Part 3):

Determination of the Exact Particle Radius Distribution for Silica Nanoparticles via Capillary Electrophoresis and Modelling the Electrophoretic Mobility with a Modified Analytic Approximation

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**Both authors contributed equally to this work.

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Part 3: CE Data

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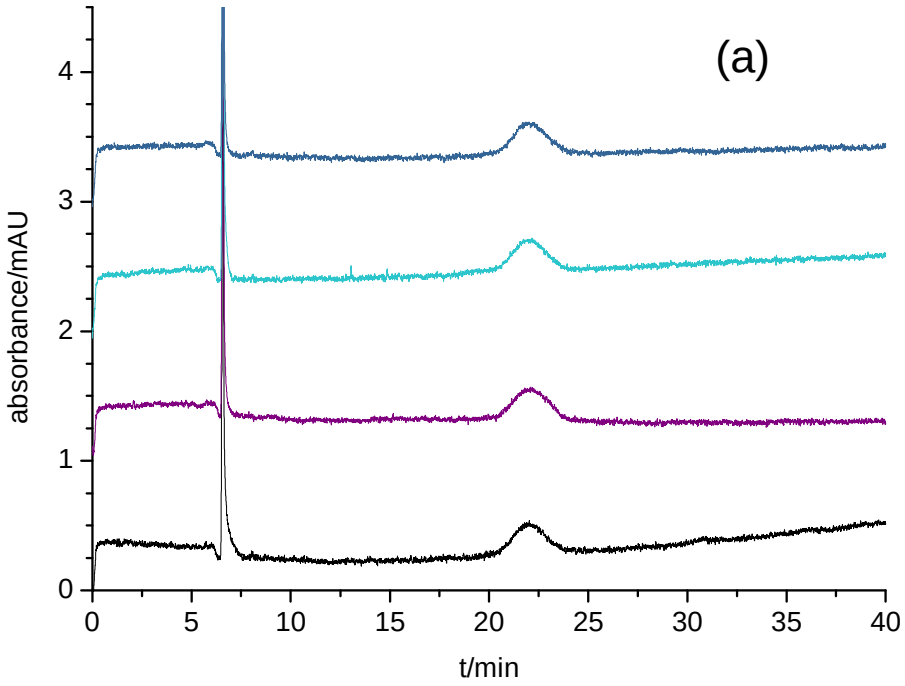
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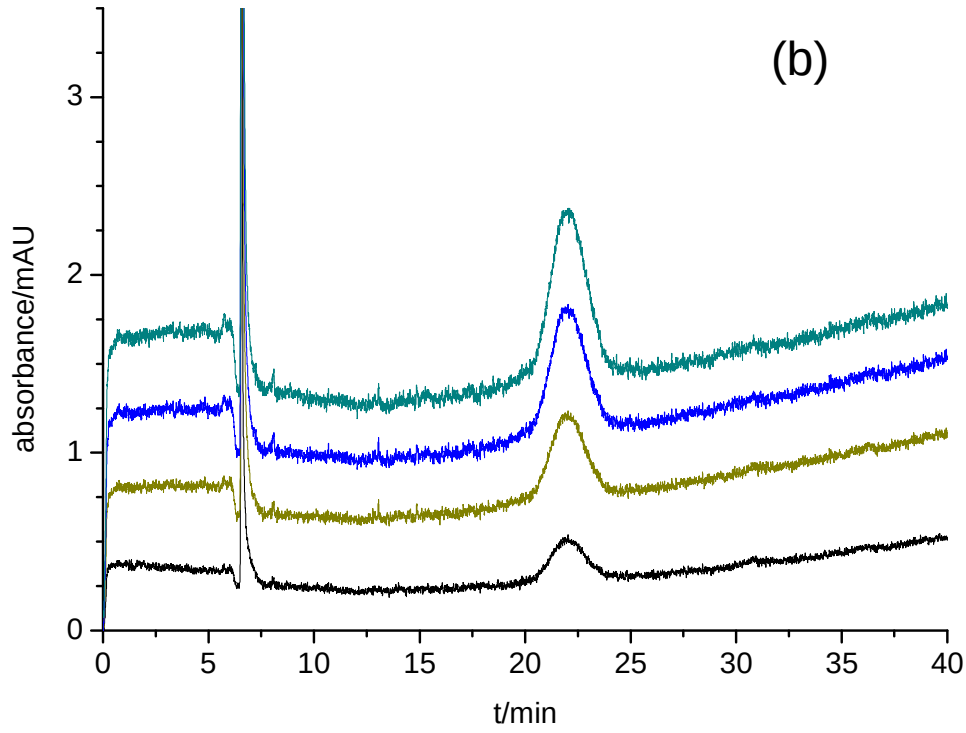
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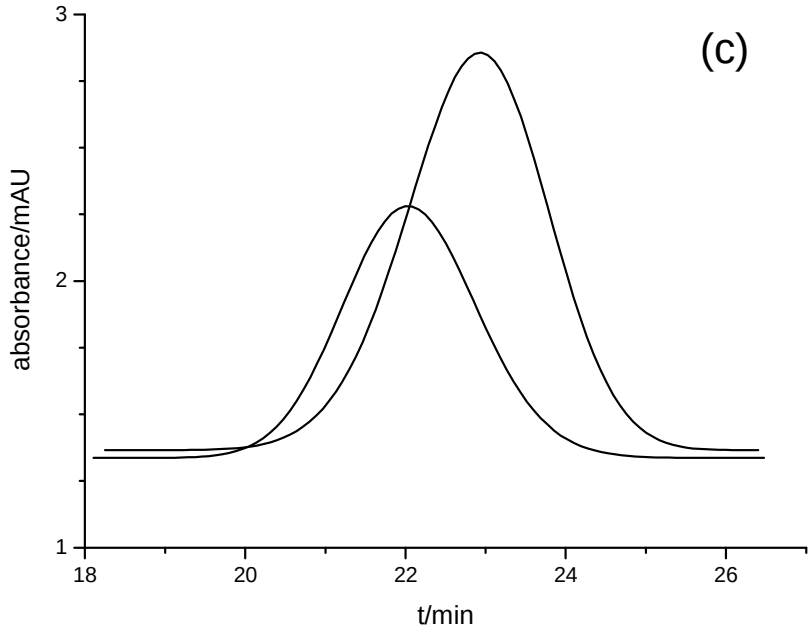
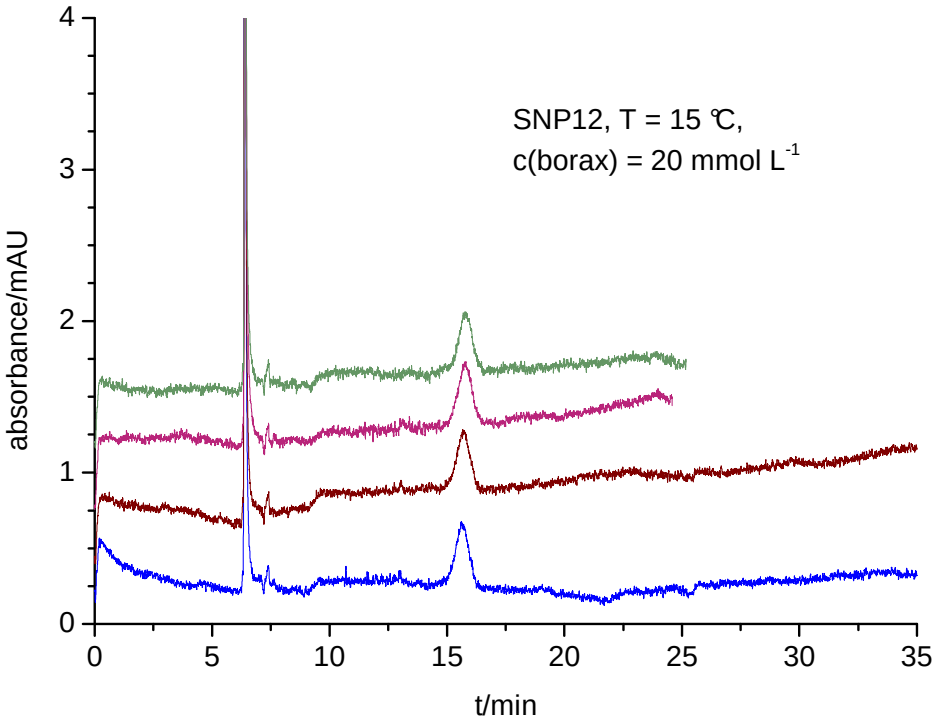


Figure S8. Electropherograms obtained for SNP22 with reduced injection volume: (a) superposition of consecutive runs (sample injection 0.1 psi (6.89 mbar) 3 s, moving average 16 points), (b) cumulative superposition (sample injection 0.1 psi (6.89 mbar) 3 s, , moving average 16 points), (c) superimposed smoothed cumulative curves (Savitzky-Golay algorithm 500 points) fitted to Gram-Charlier series of type A (upper curve: sample injection 0.1 psi (6.89 mbar) 6 s, lower curve: sample injection 0.1 psi (6.89 mbar) 3 s). Experimental conditions: T = 20 °C, total length of capillary = 395 mm, capillary length to detector = 292 mm, inner diameter of fused silica capillary = 75 μm, separation electrolyte 30 mmol L^{-1} borax in water (pH = 9.2), separation voltage 7 kV, data rate 16 Hz, absorbance detection 214 nm.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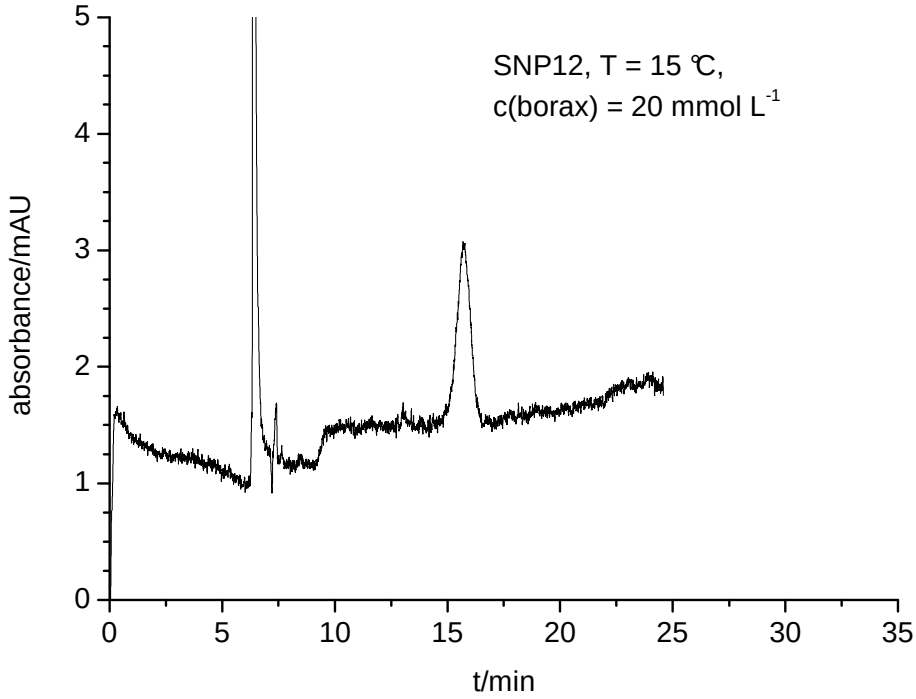
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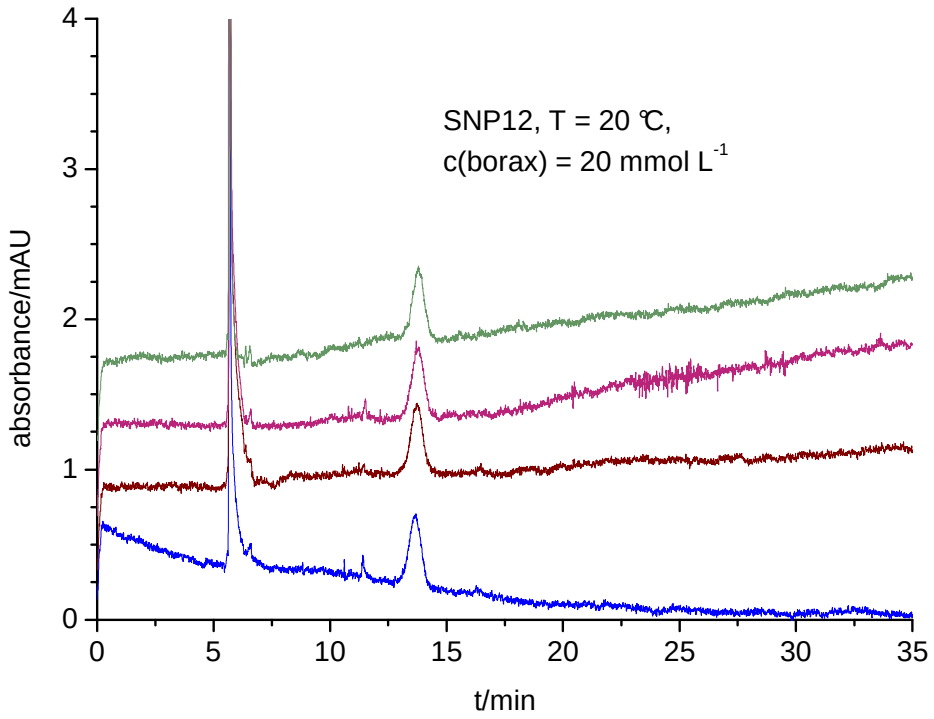
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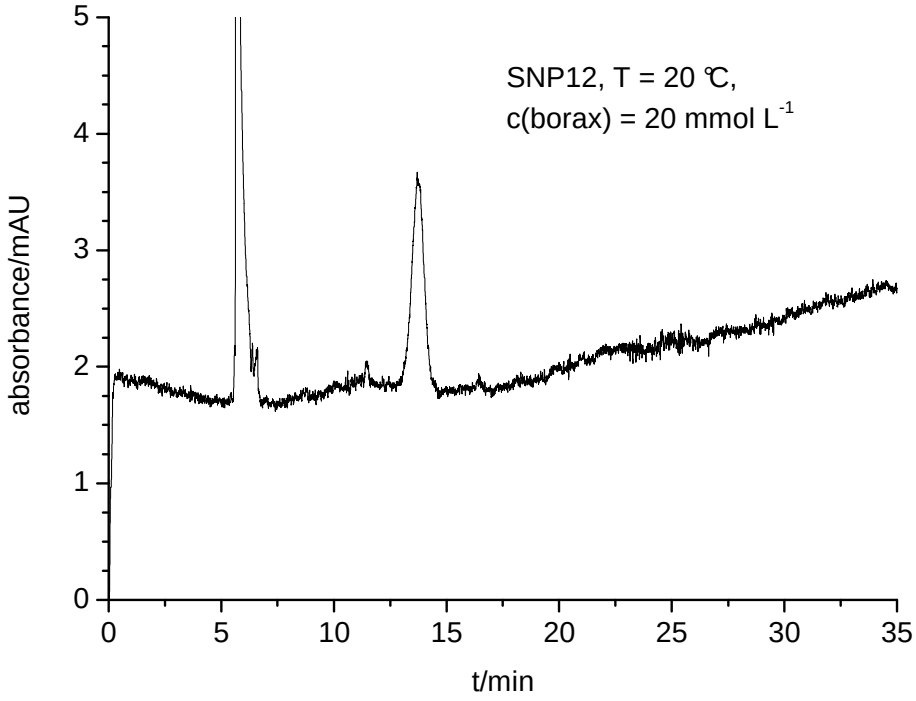
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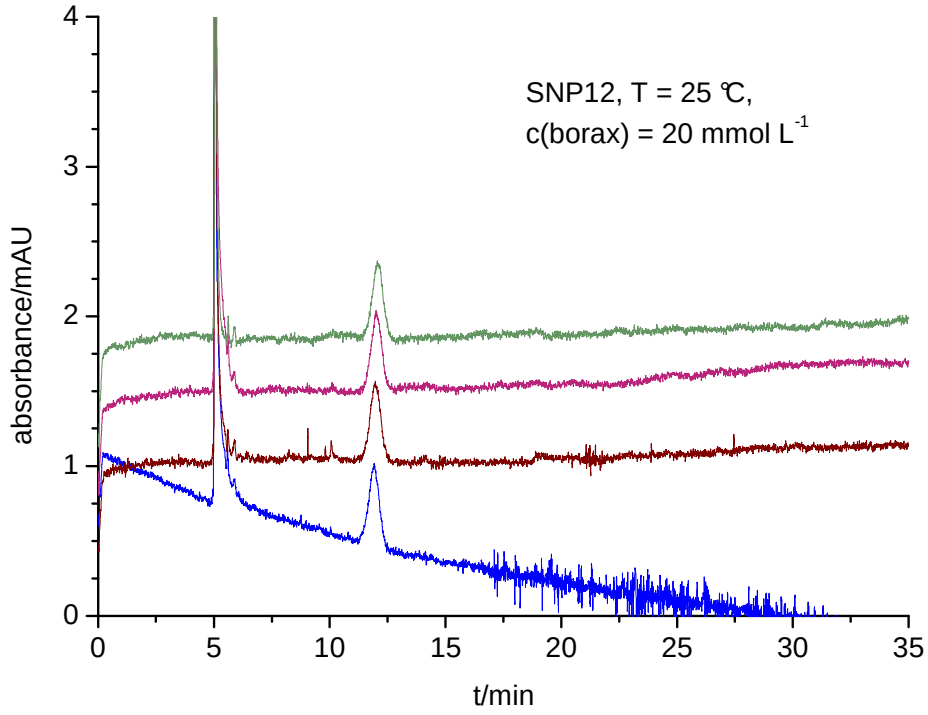
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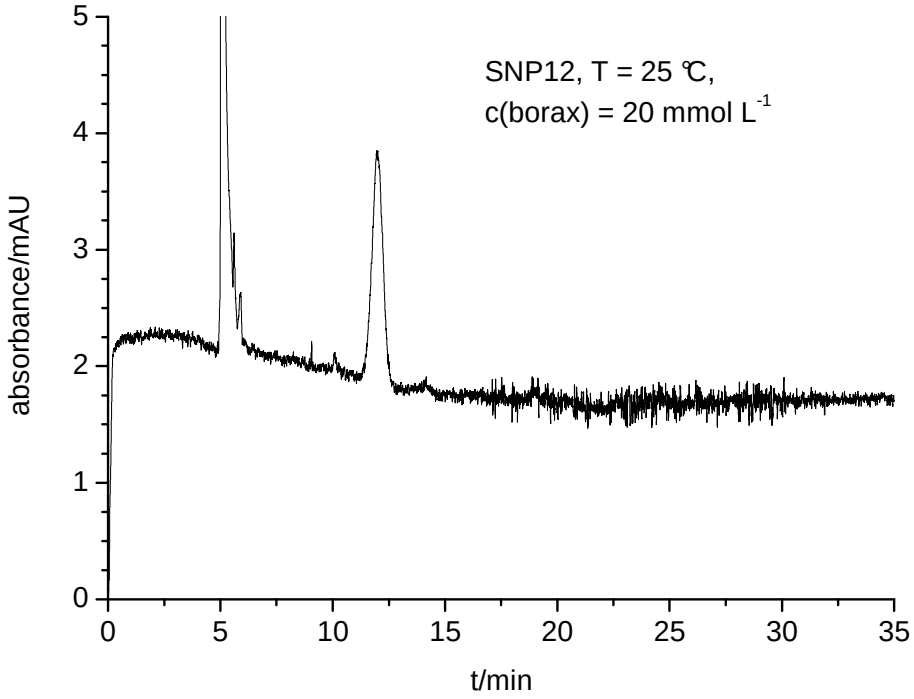
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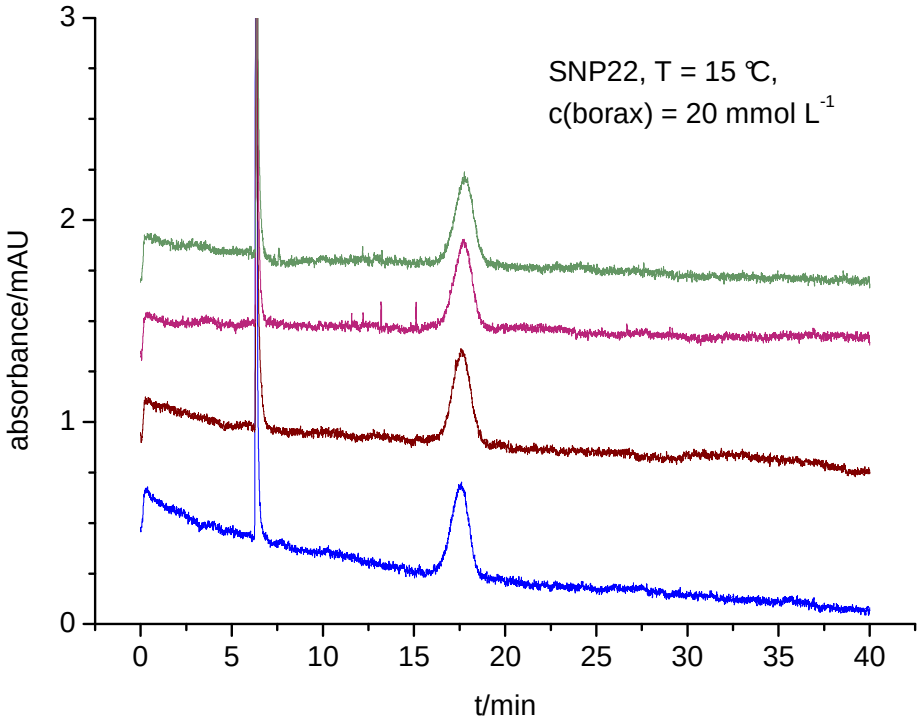
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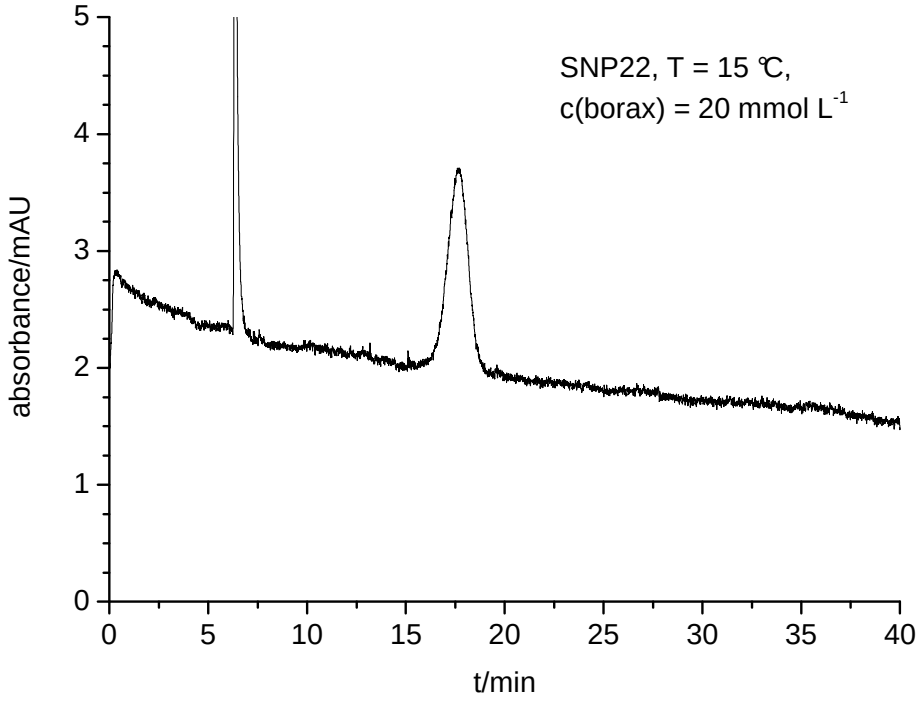
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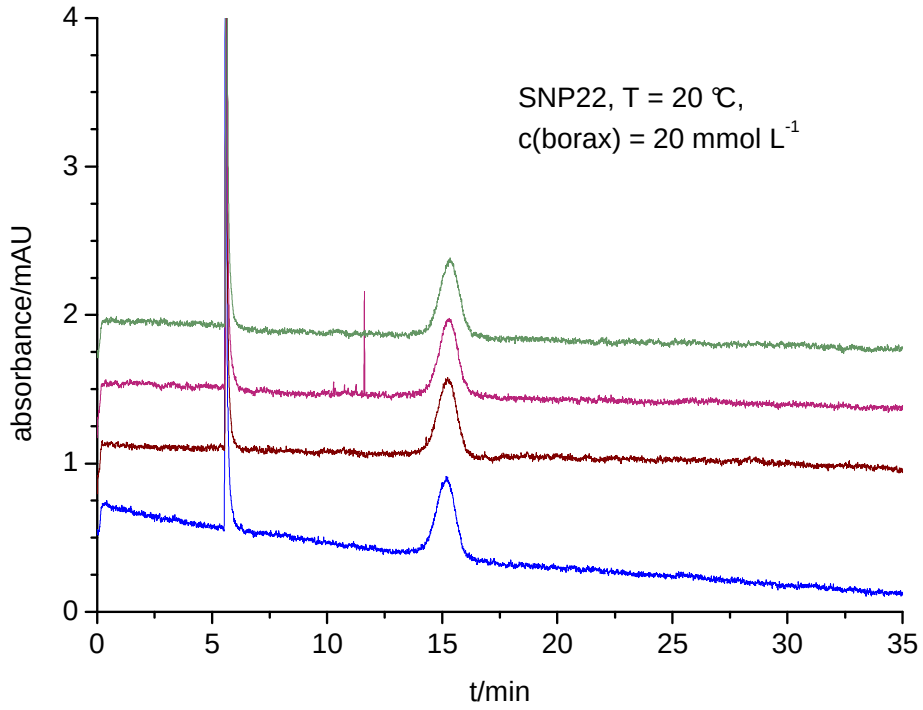
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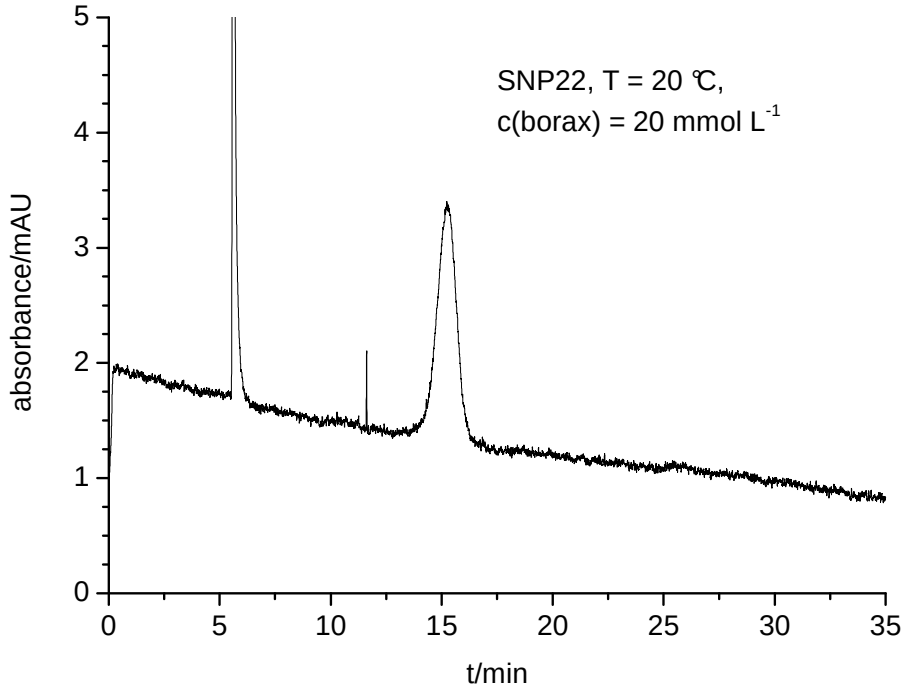
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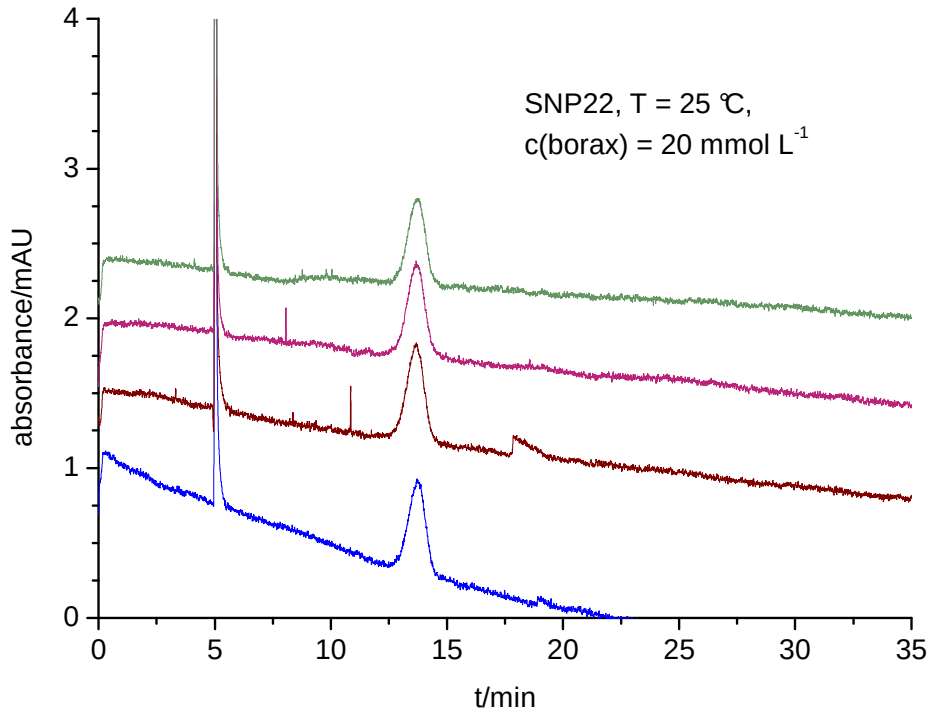
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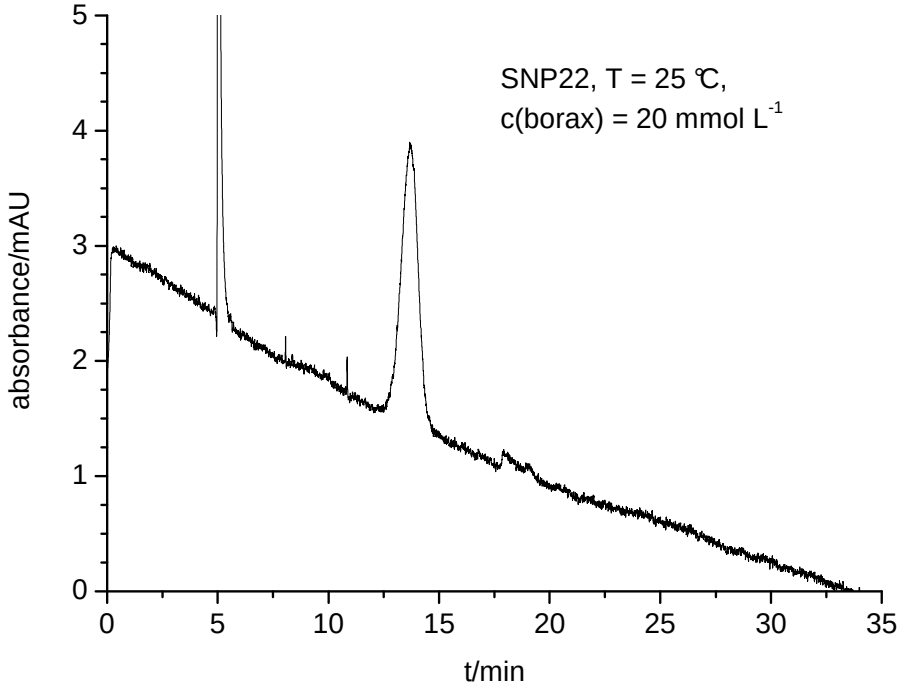
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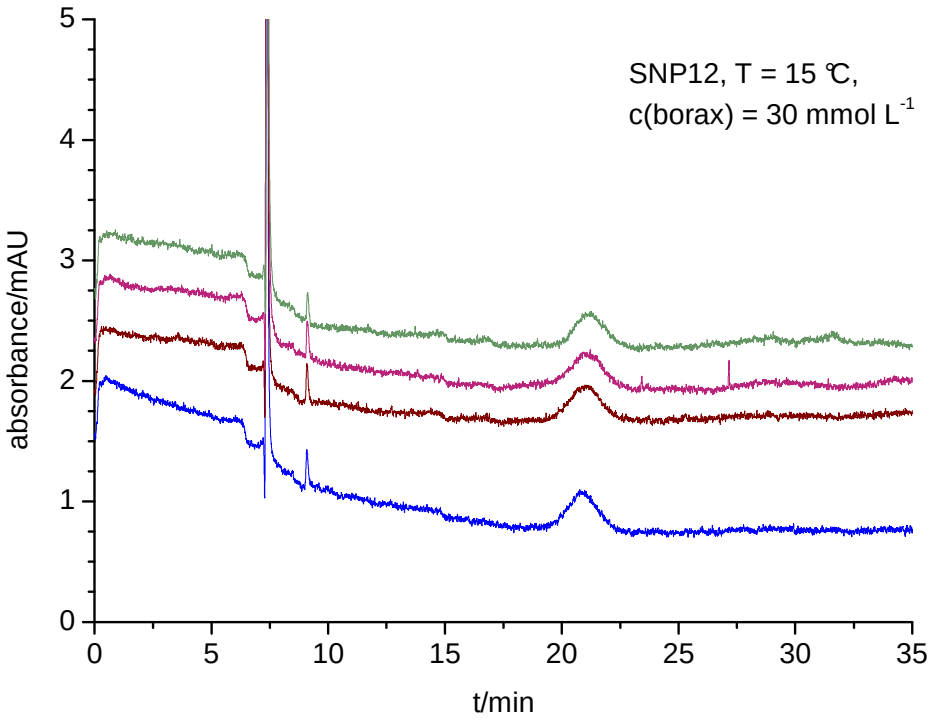
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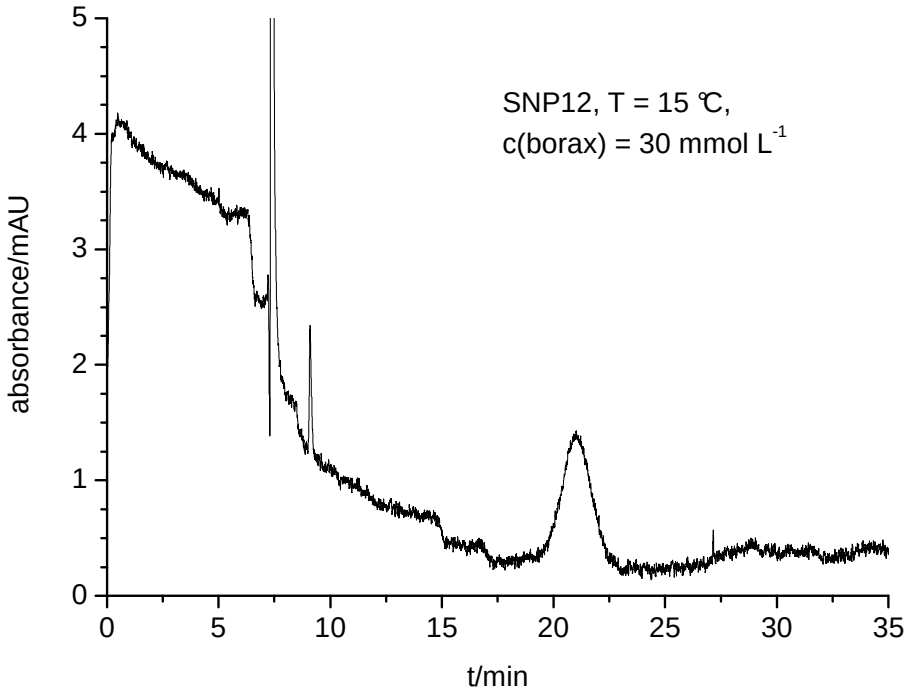
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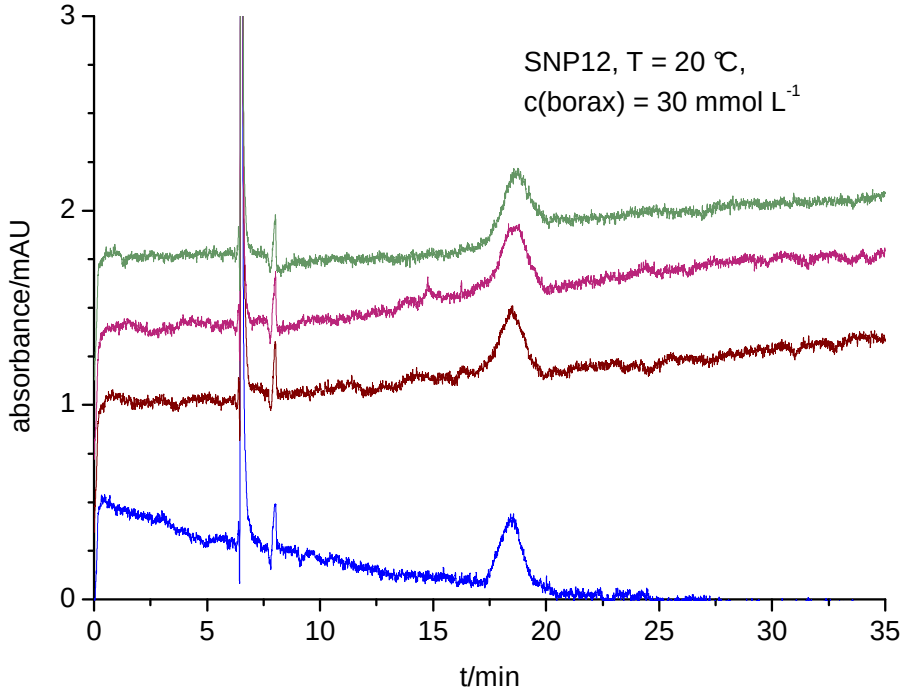
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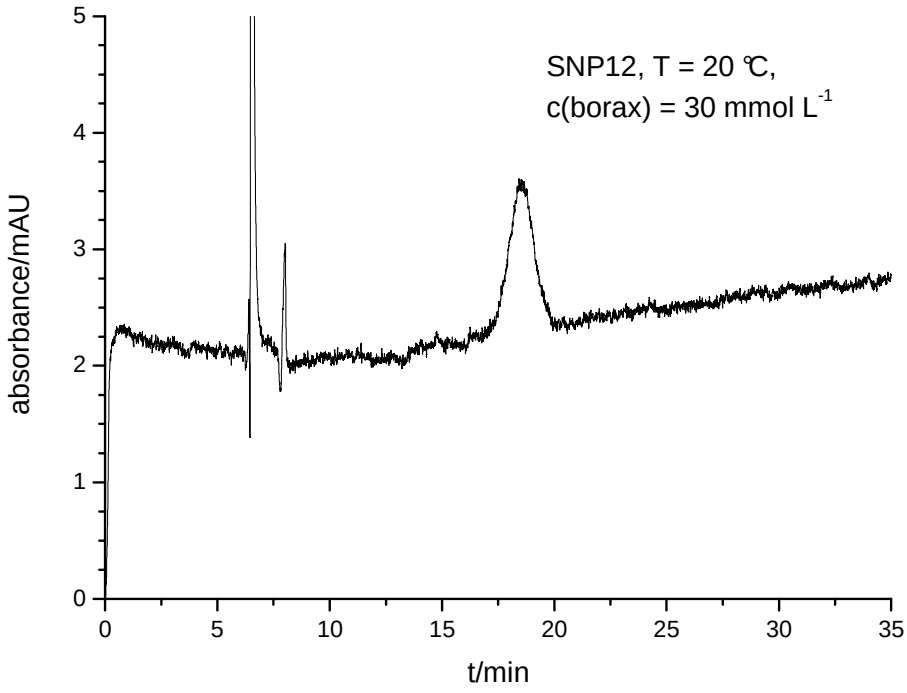
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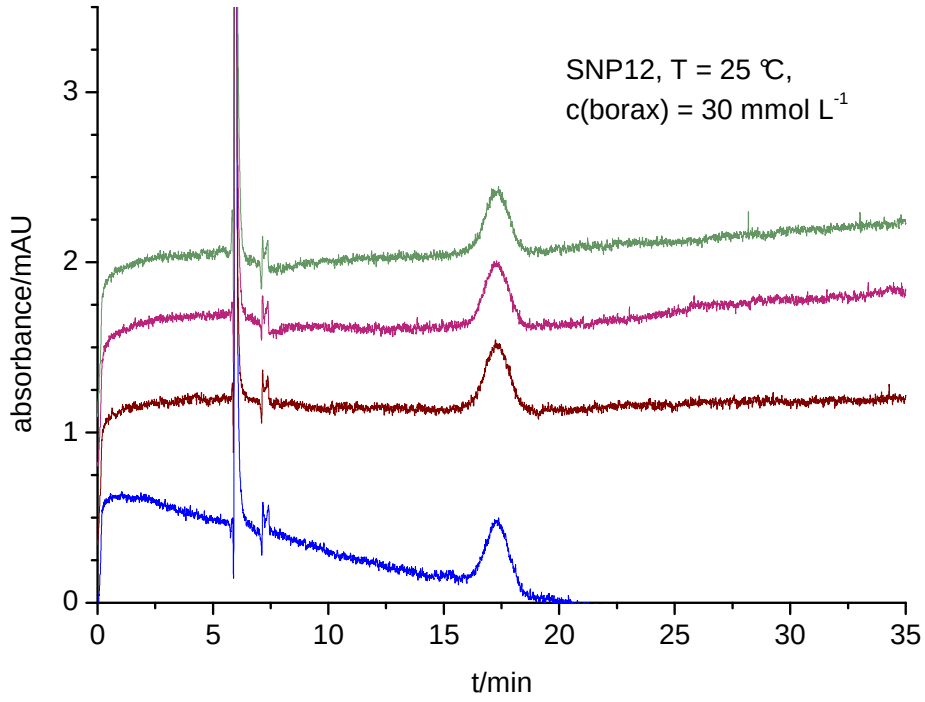
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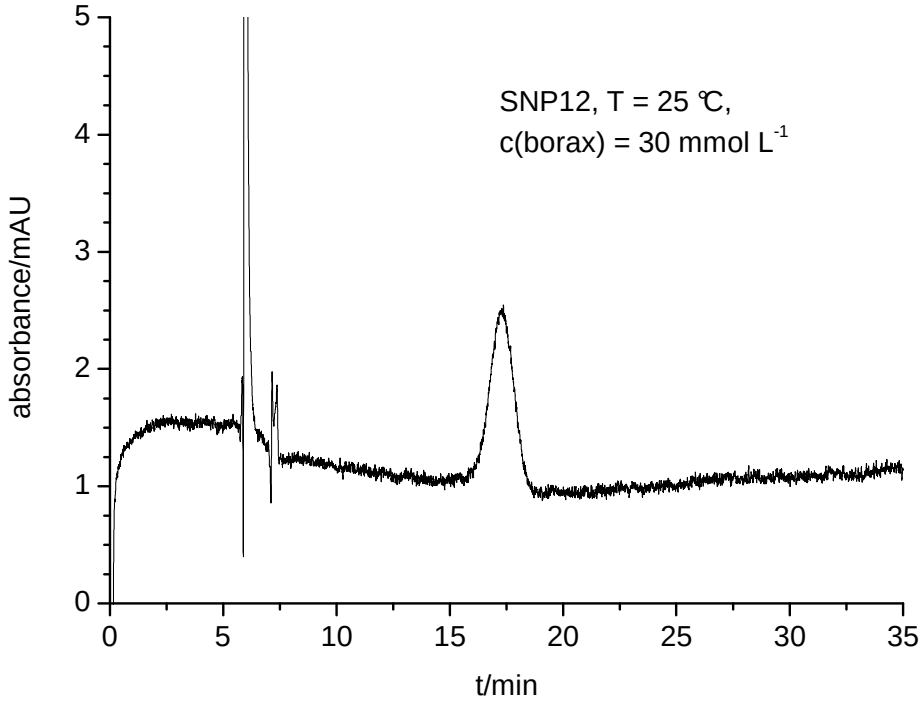
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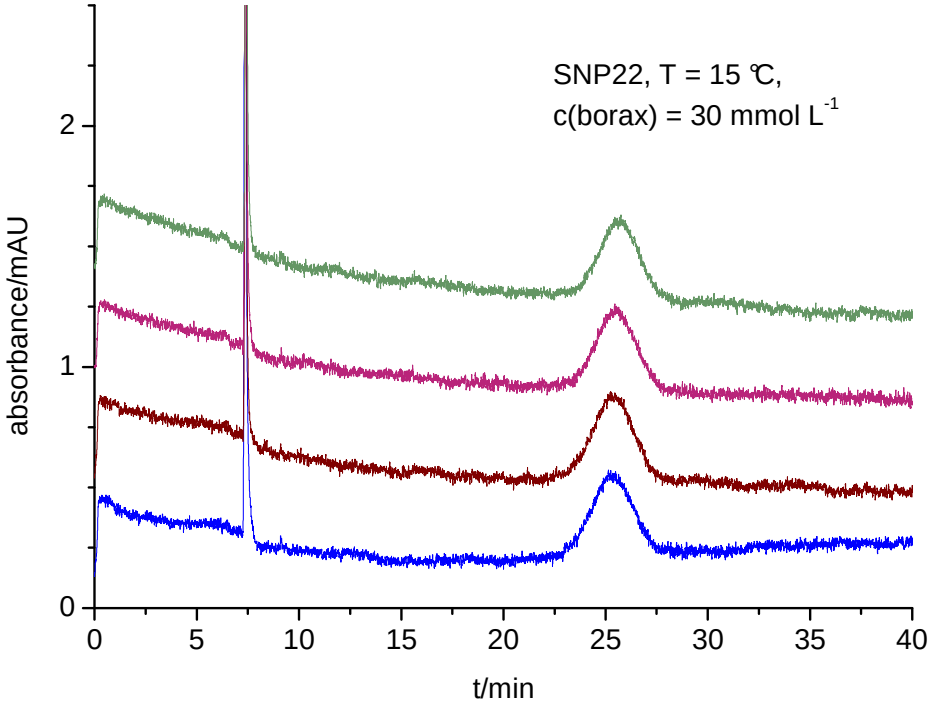
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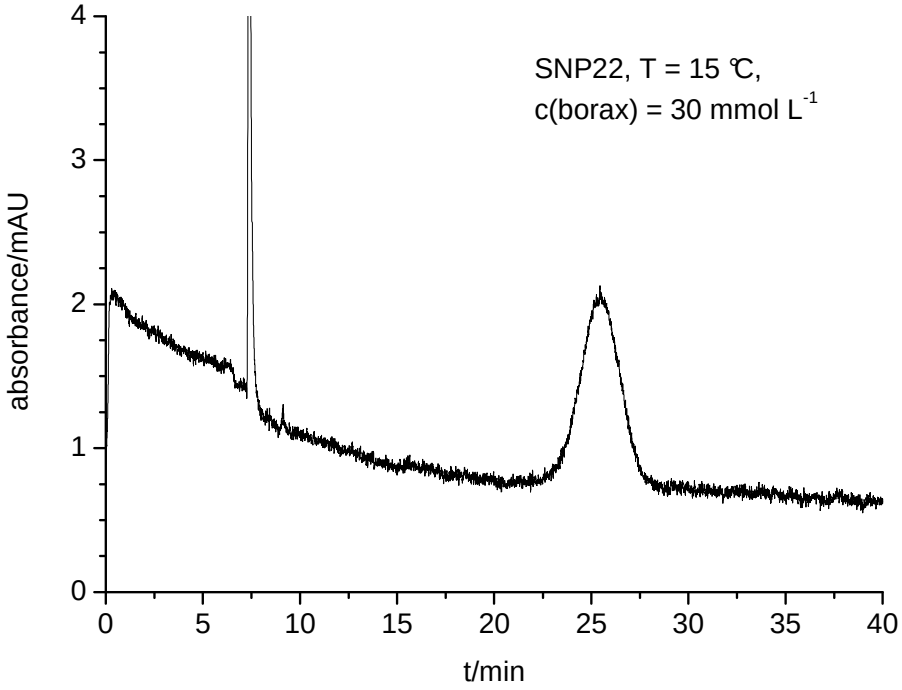
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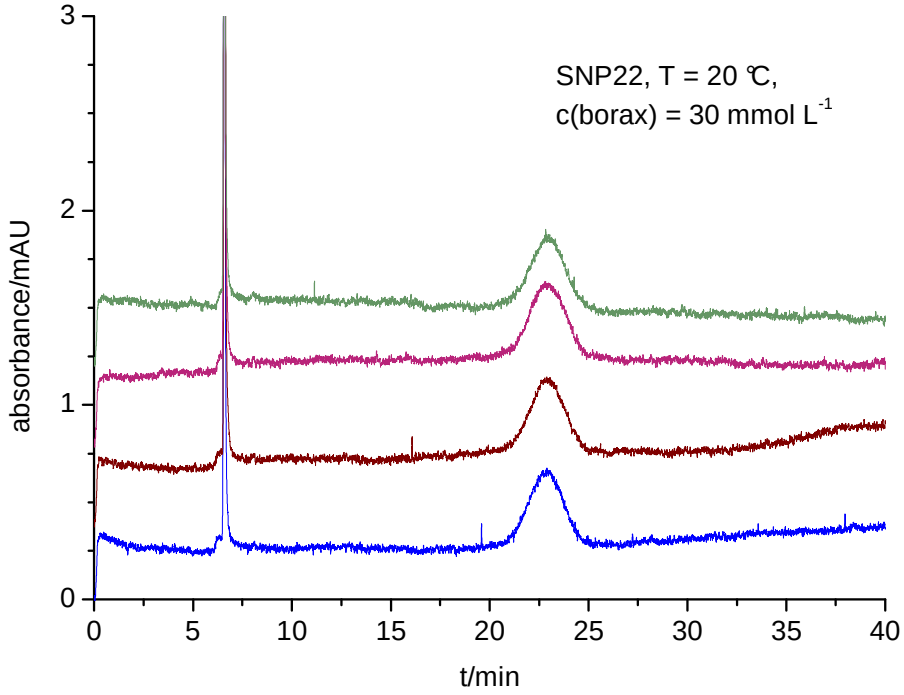
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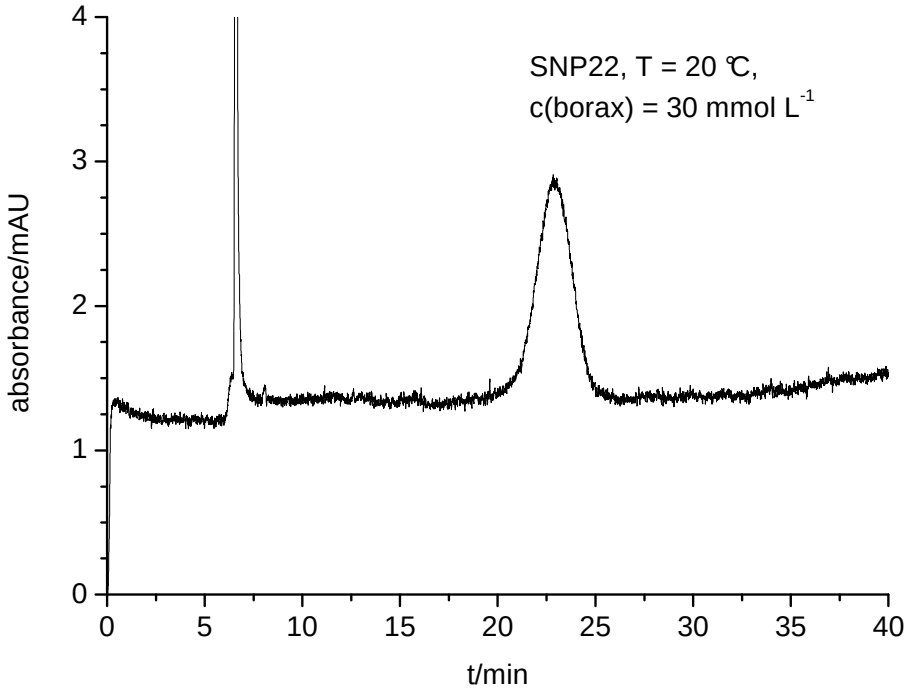
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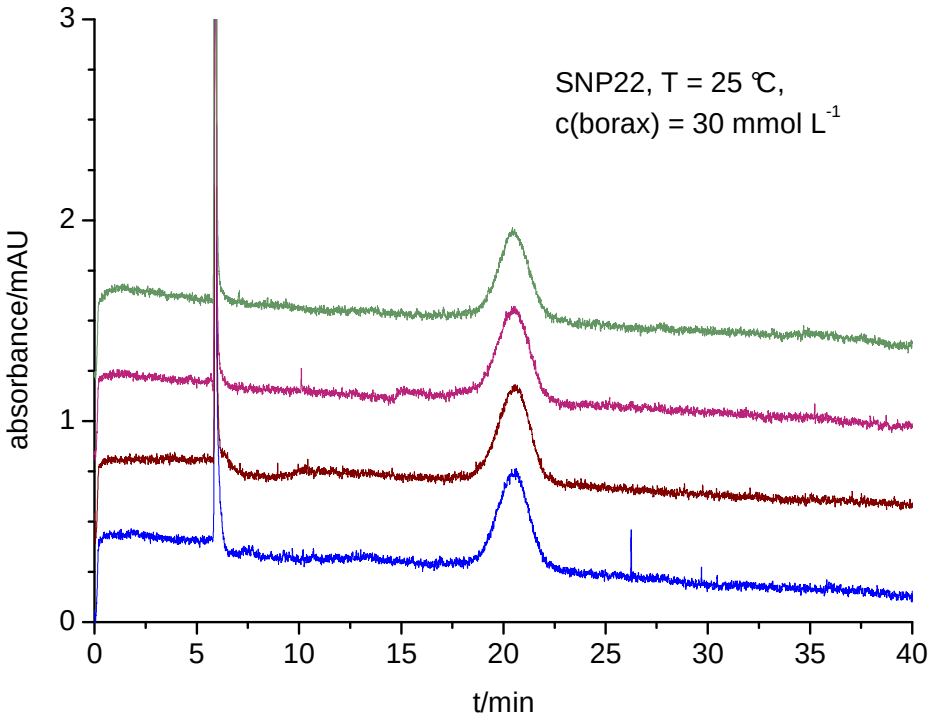
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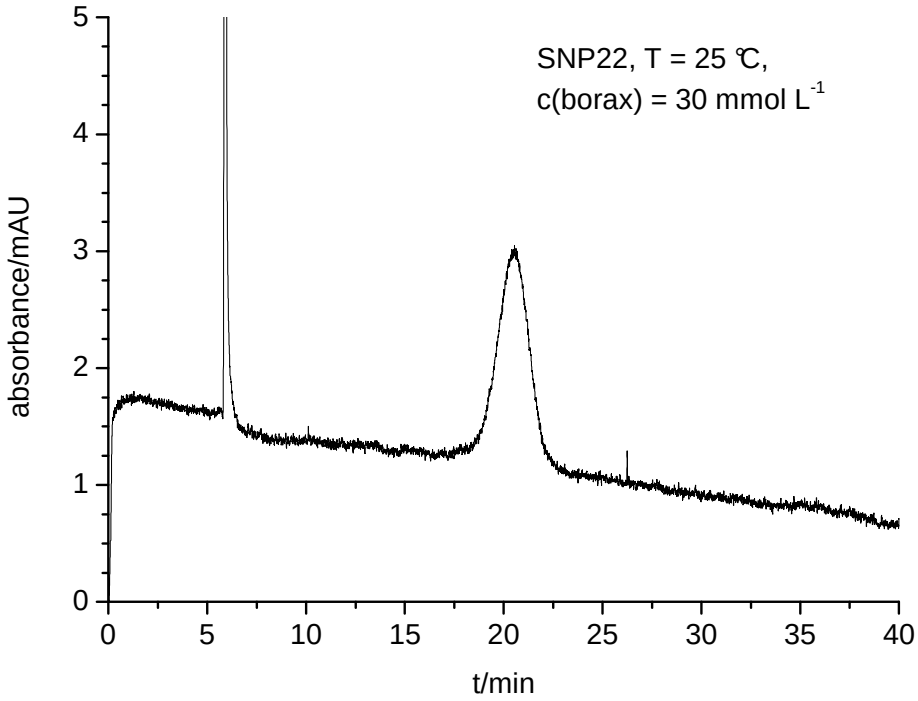
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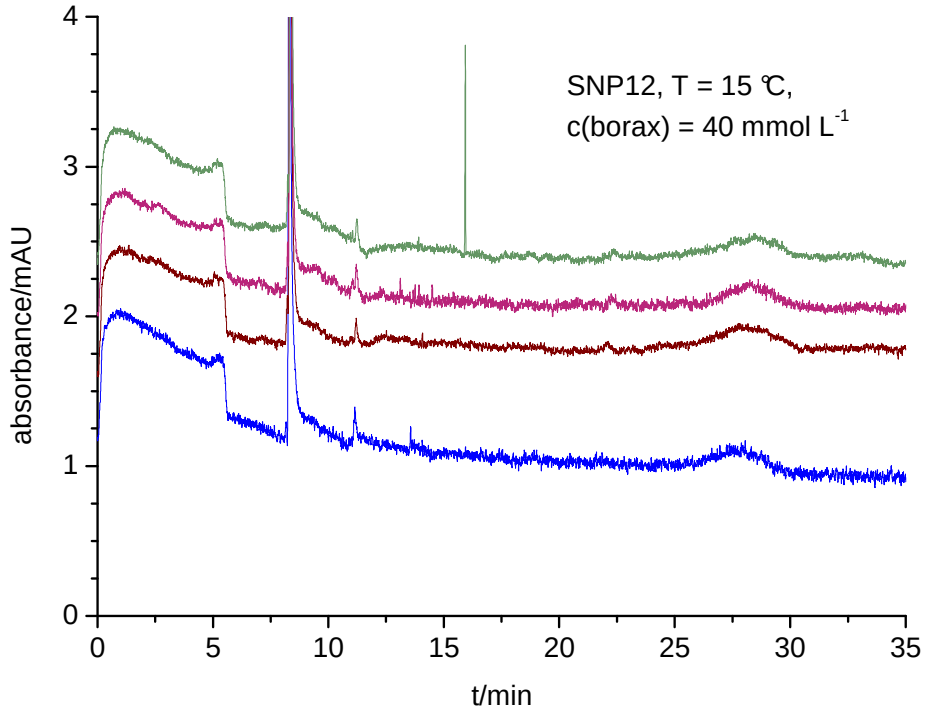
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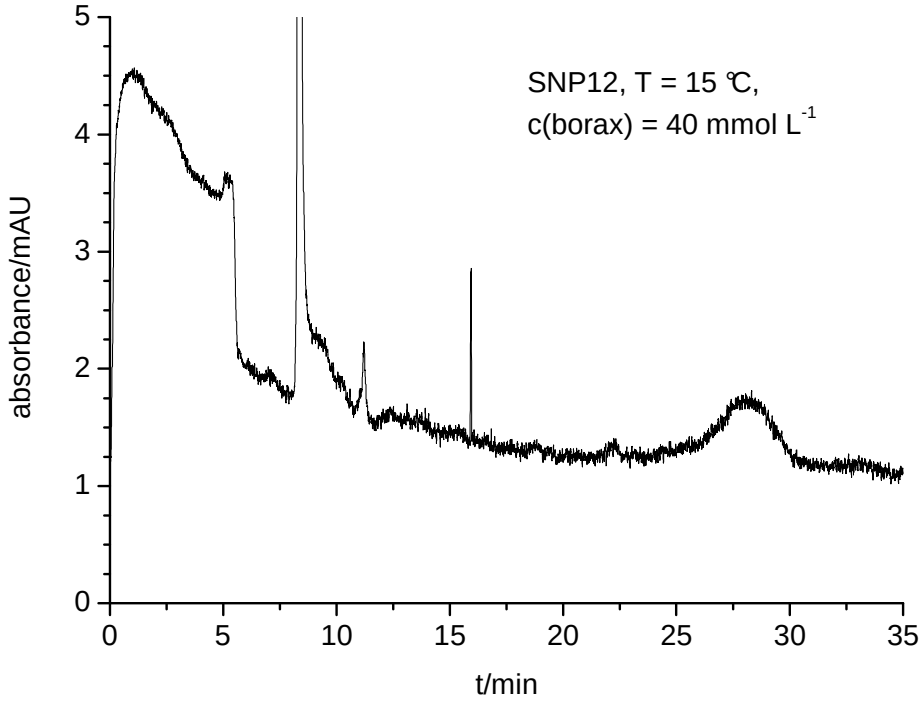
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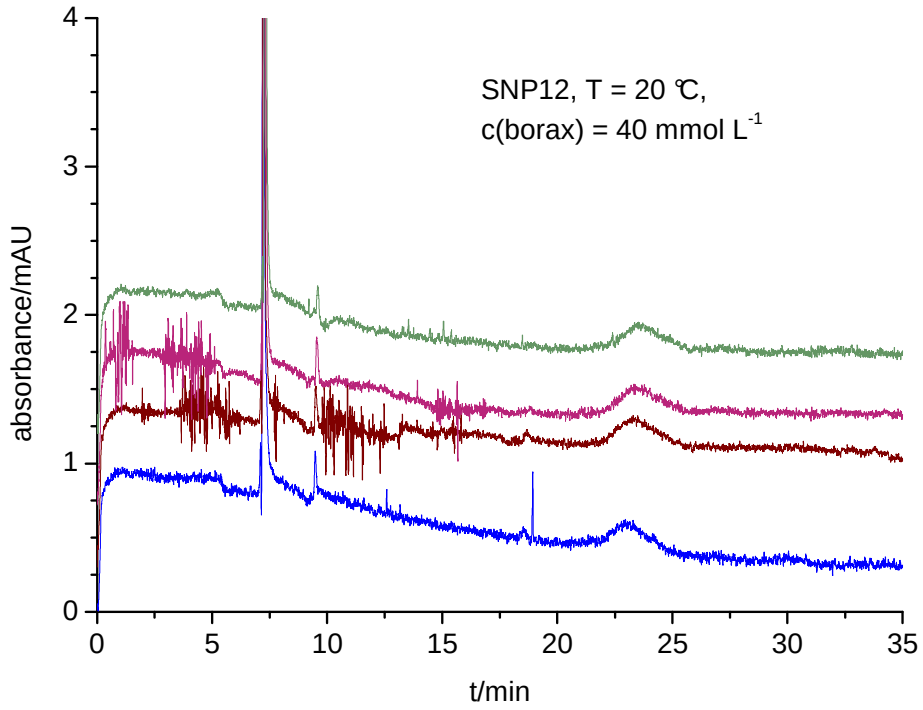
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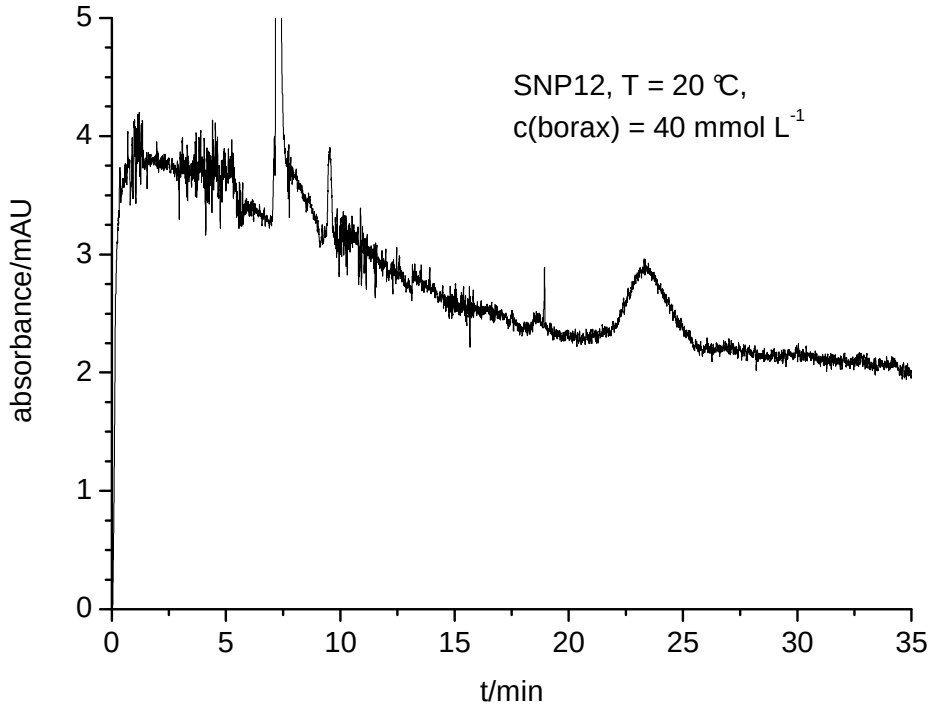
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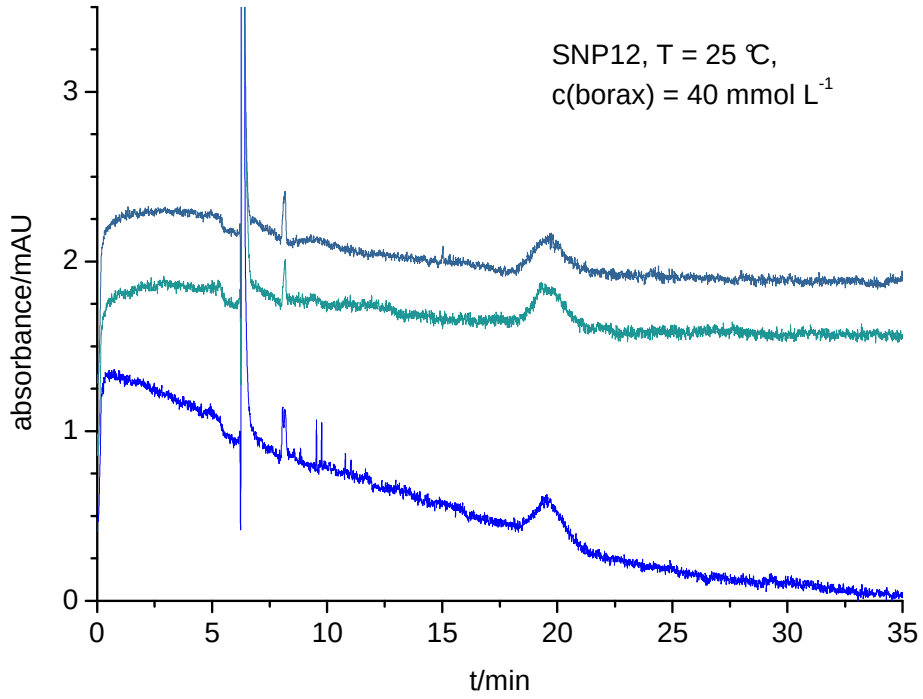
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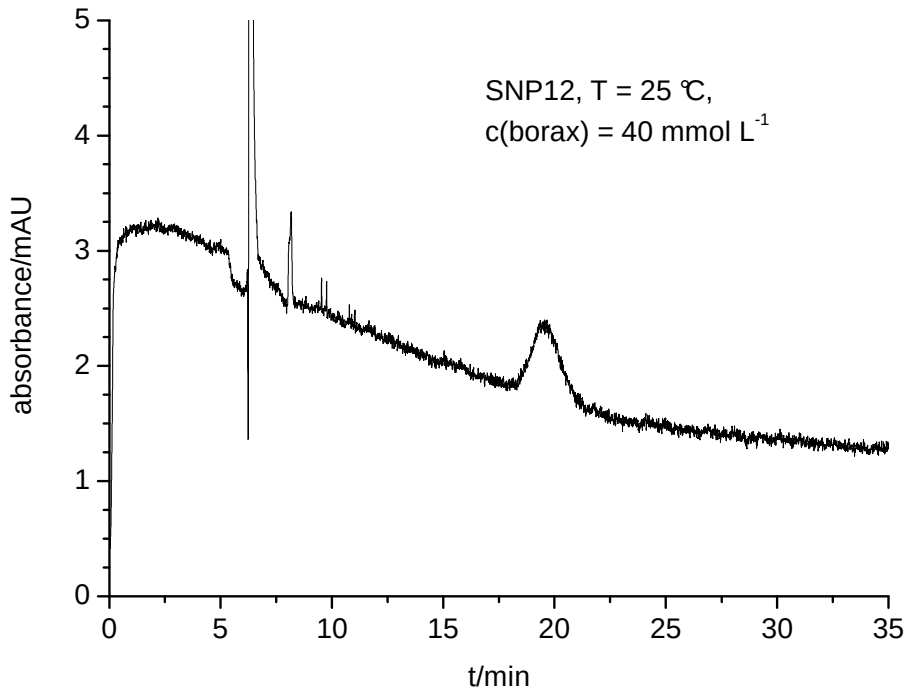
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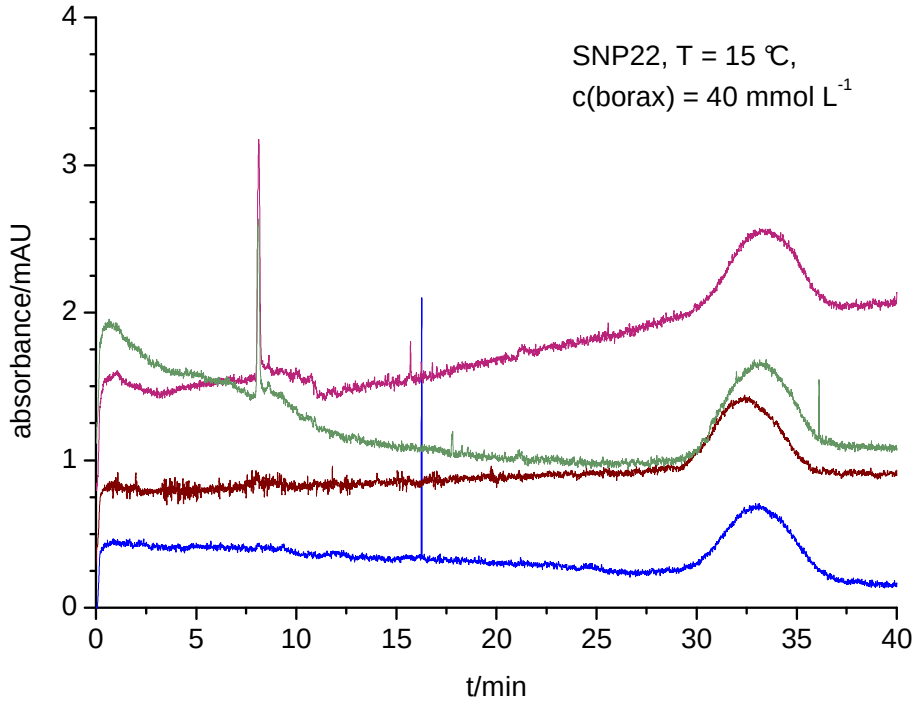
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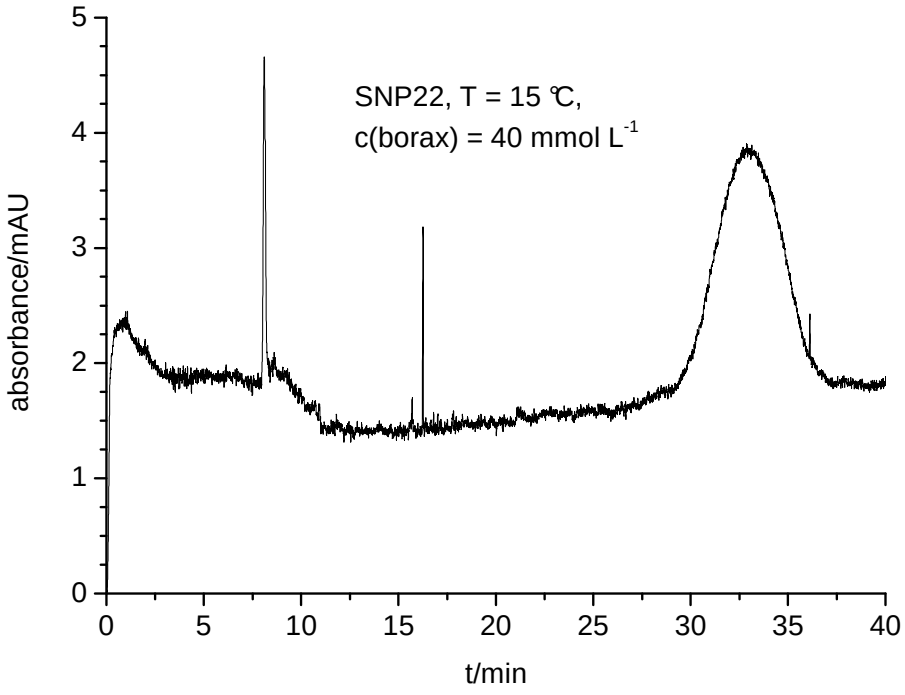
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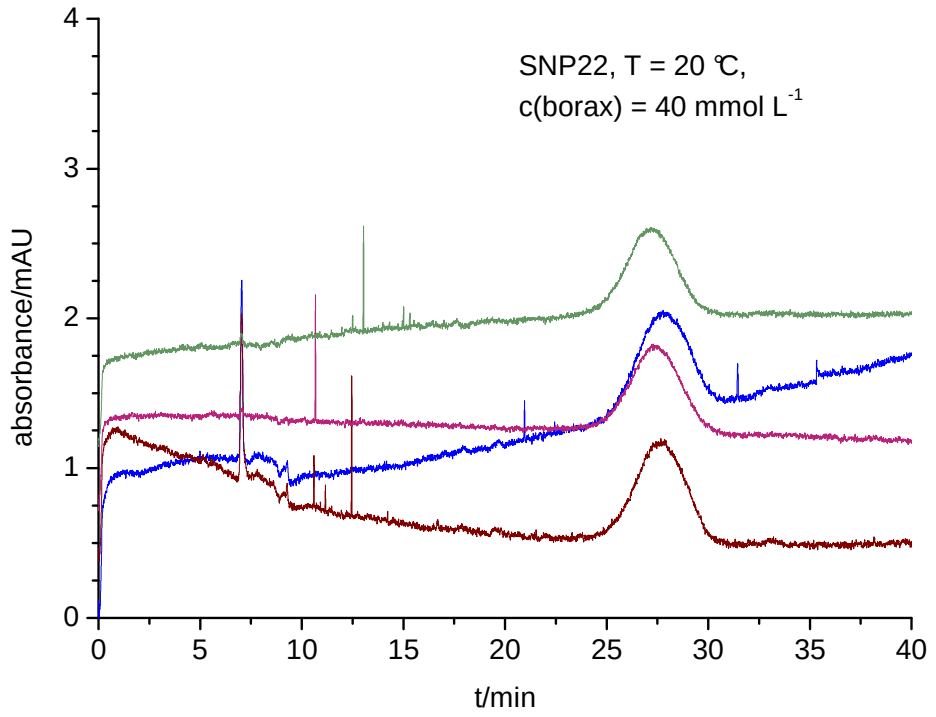
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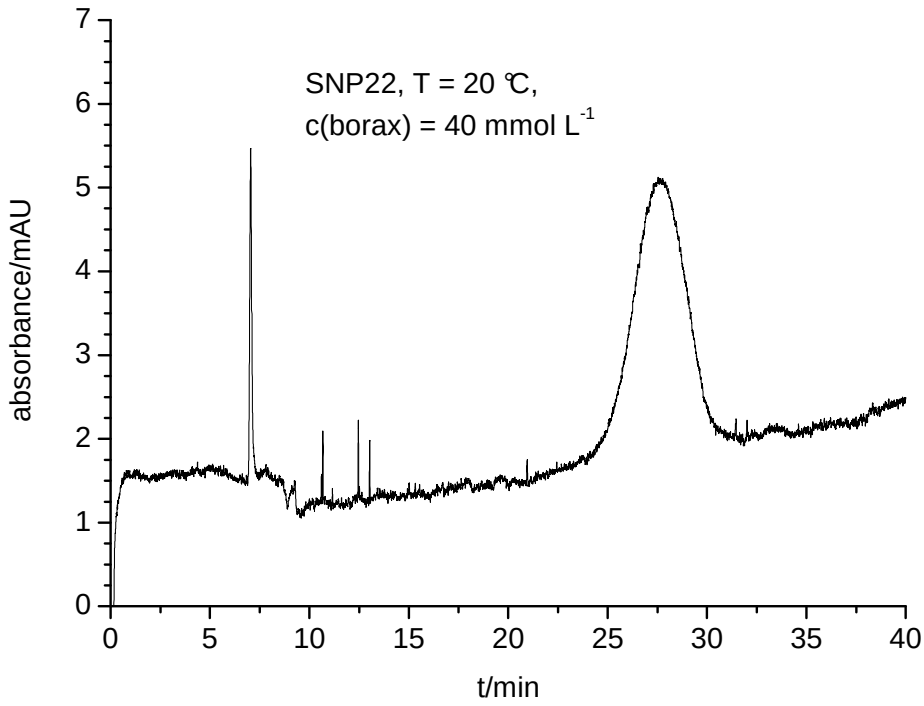
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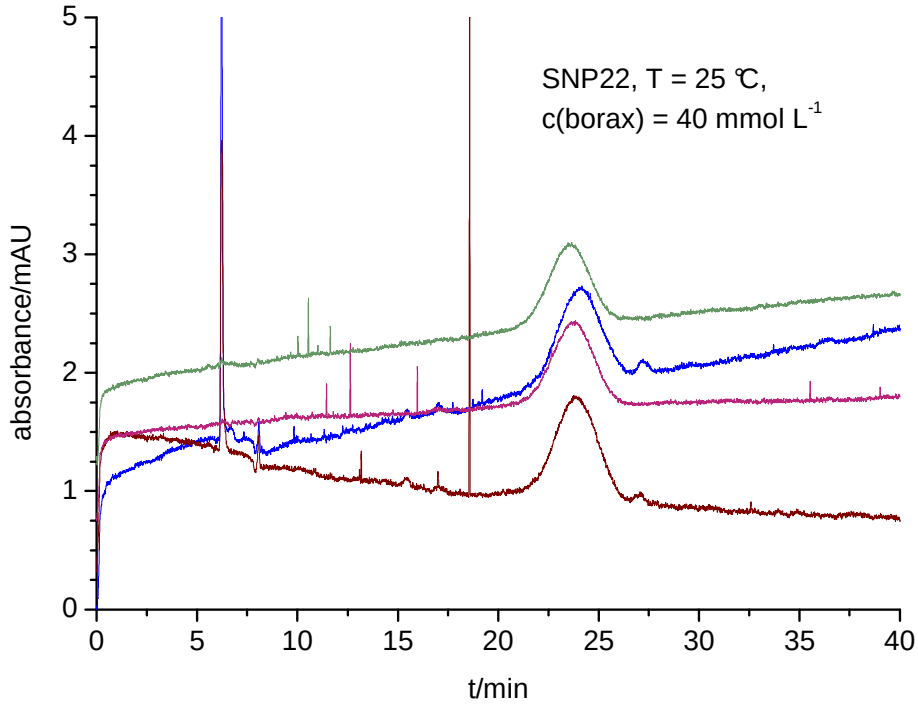
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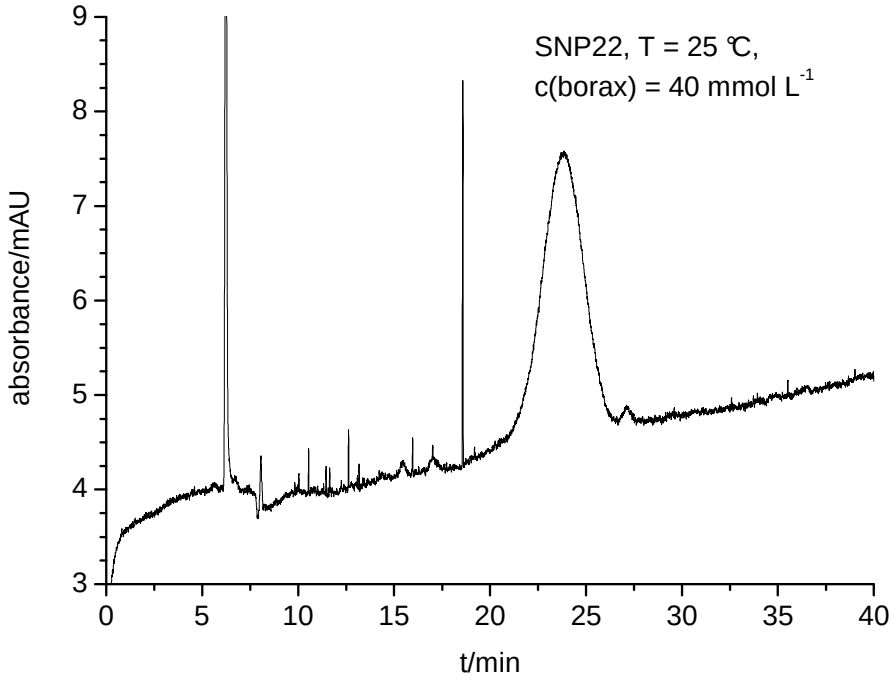
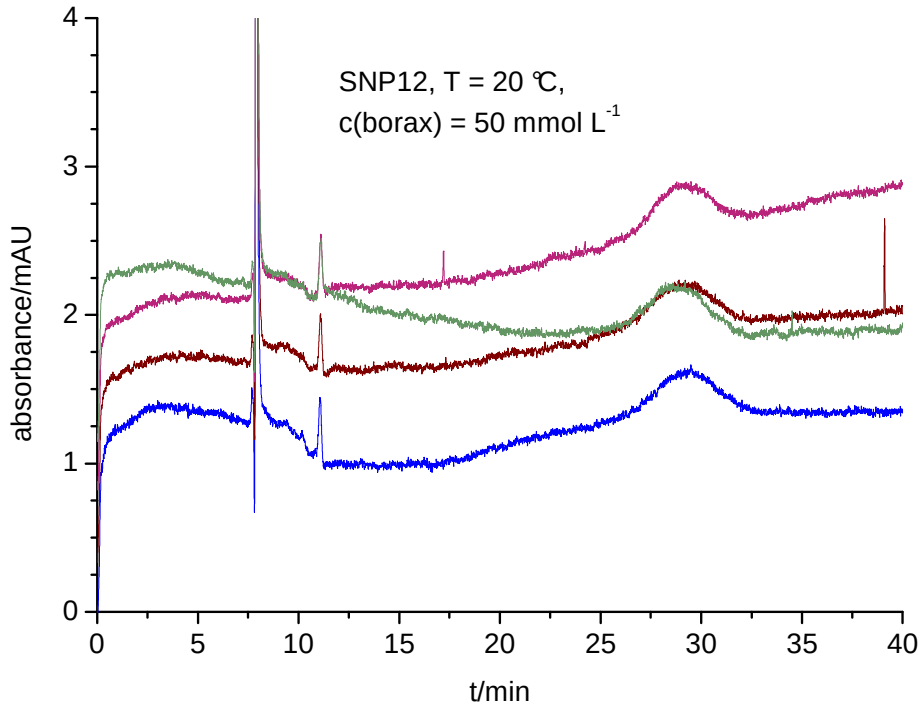
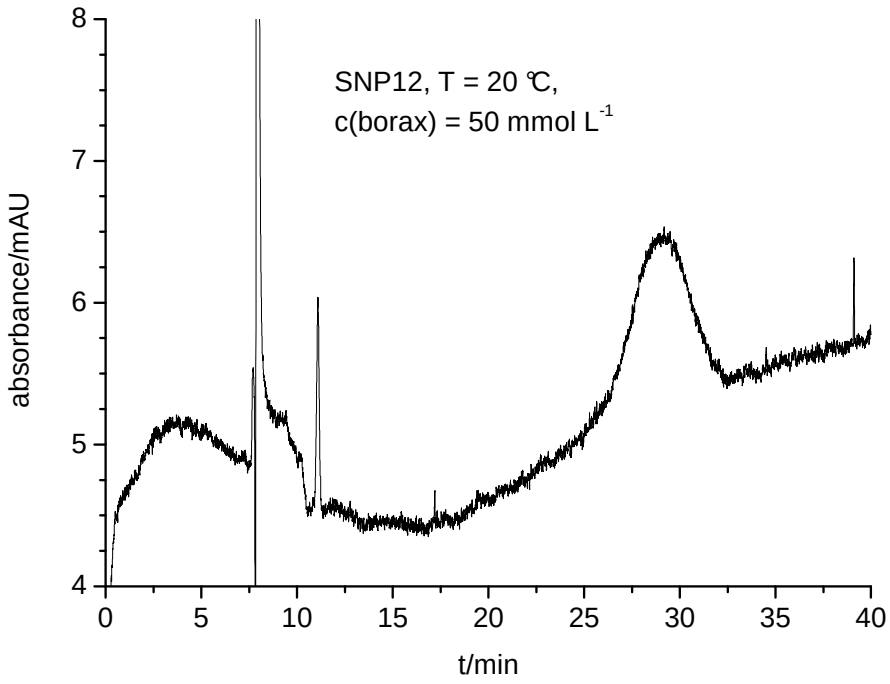
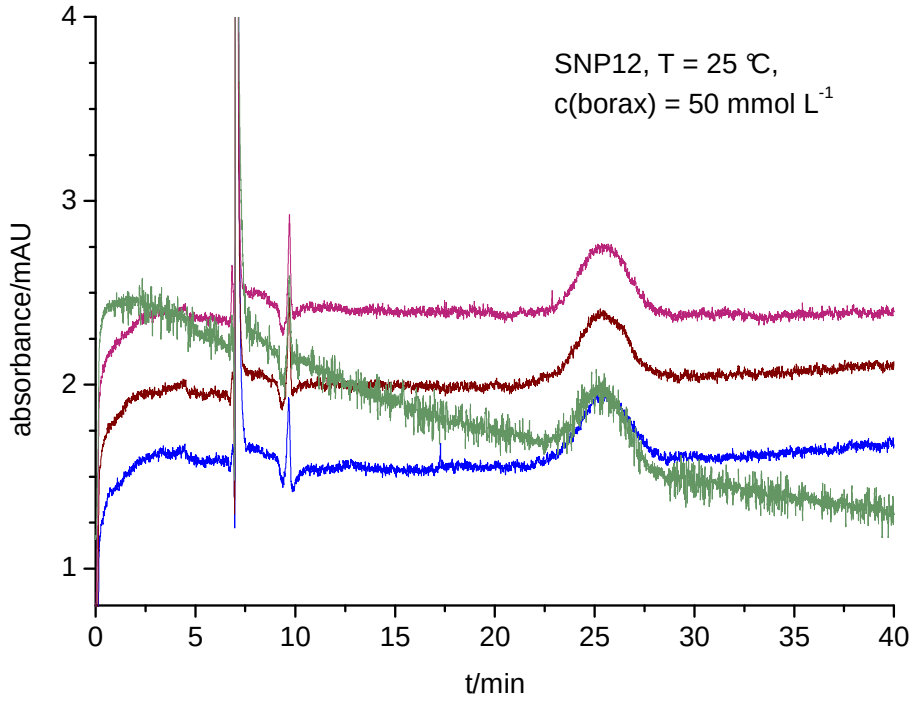
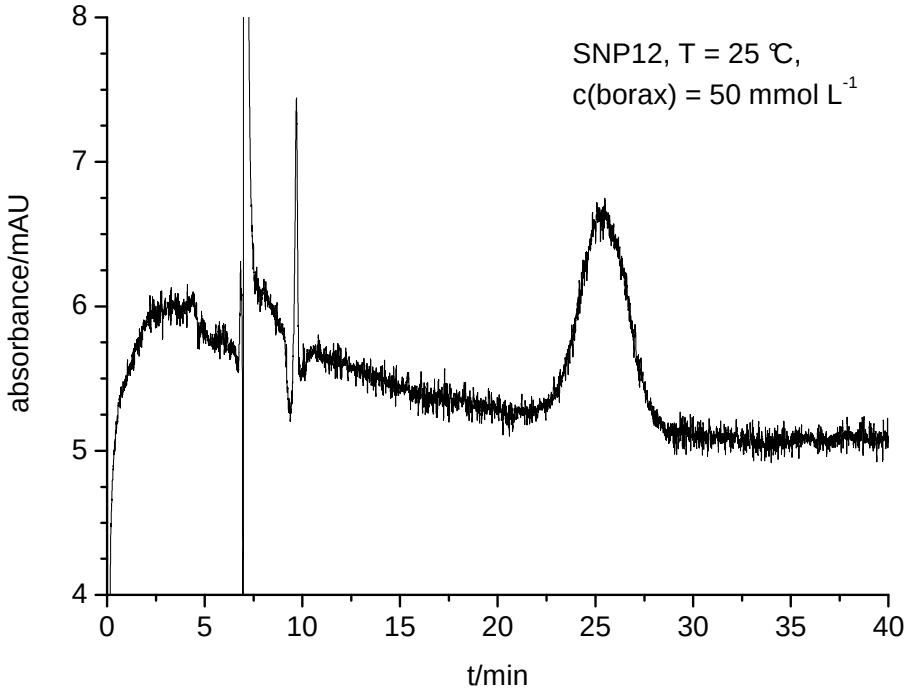
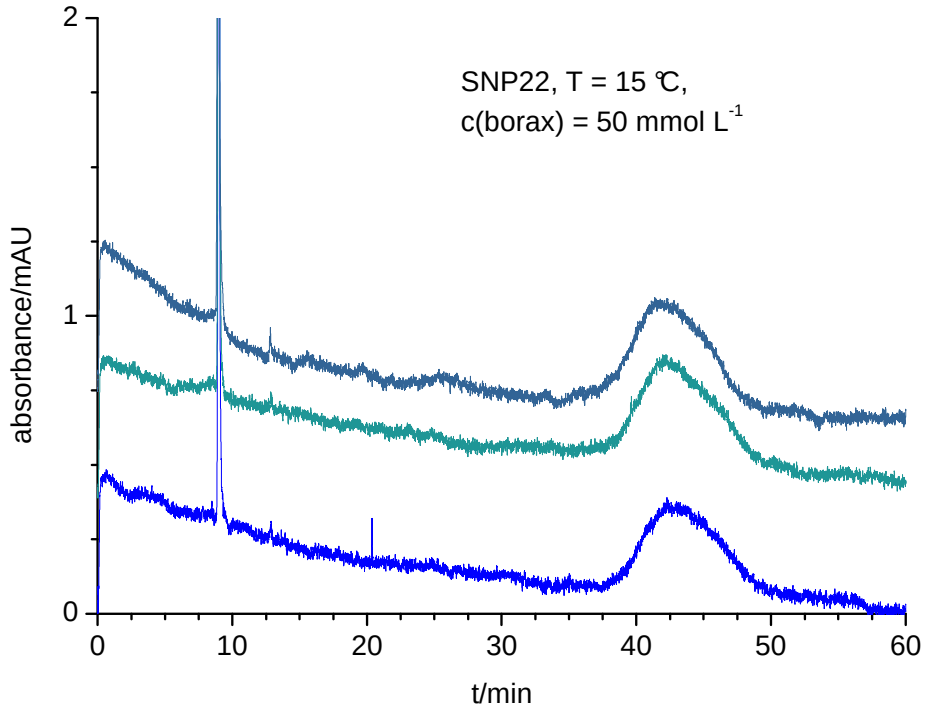

SNP22, T = 25 ℃,
c(borax) = 40 mmol L-1
absorbance/mAU
t/min
3
4
5
6
7
8
9
0
5
10
15
20
25
30
35
40

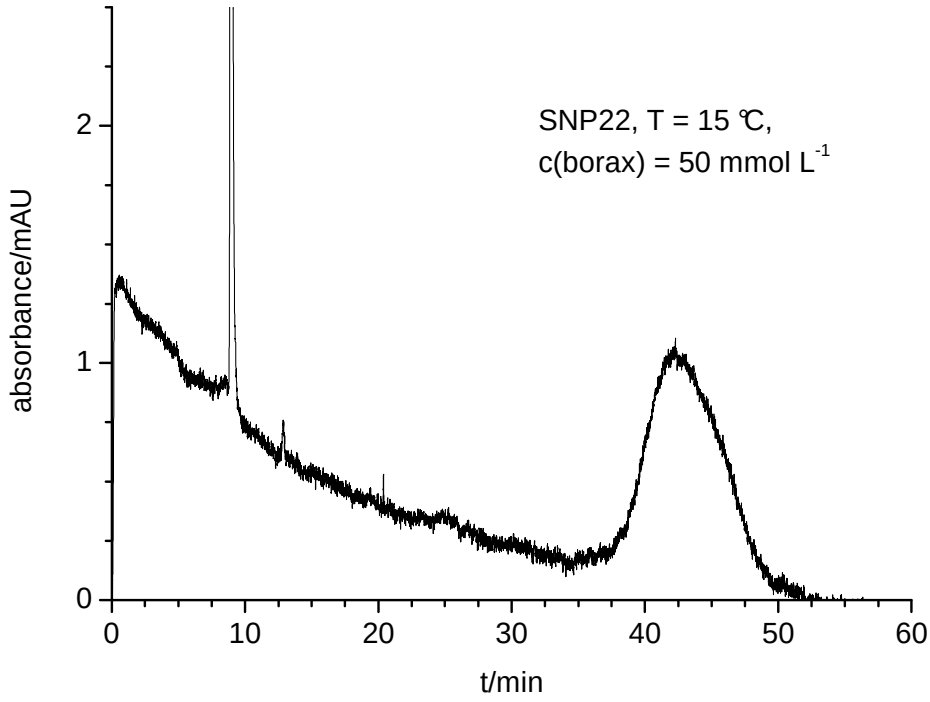

SNP12, T = 20 ℃,
c(borax) = 50 mmol L-1
absorbance/mAU
t/min
0
1
2
3
4
0
5
10
15
20
25
30
35
40

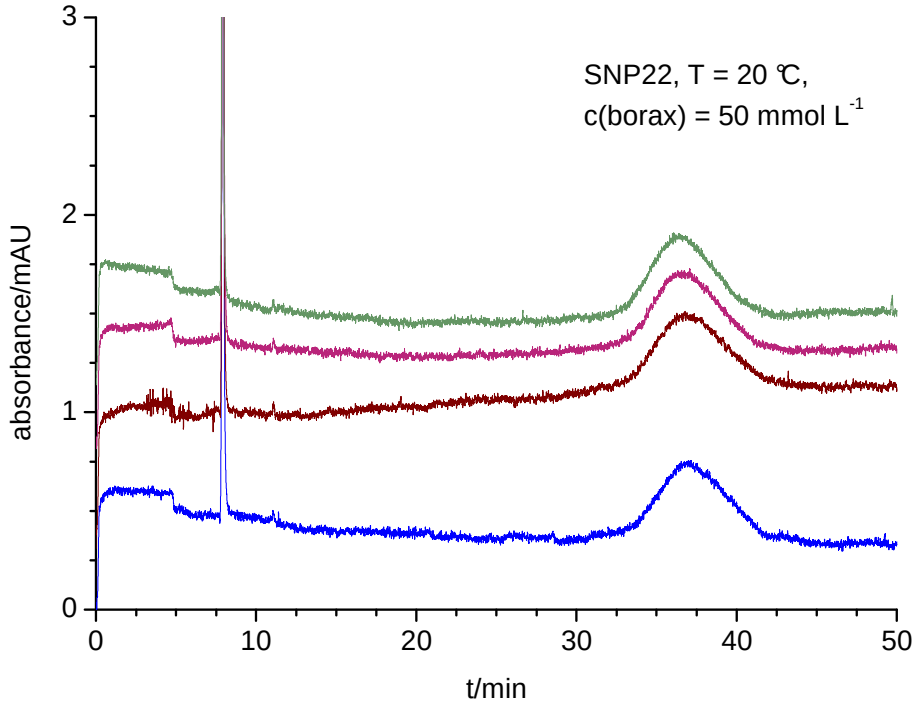

SNP12, T = 20 ℃,
c(borax) = 50 mmol L-1
absorbance/mAU
t/min
4
5
6
7
8
0
5
10
15
20
25
30
35
40

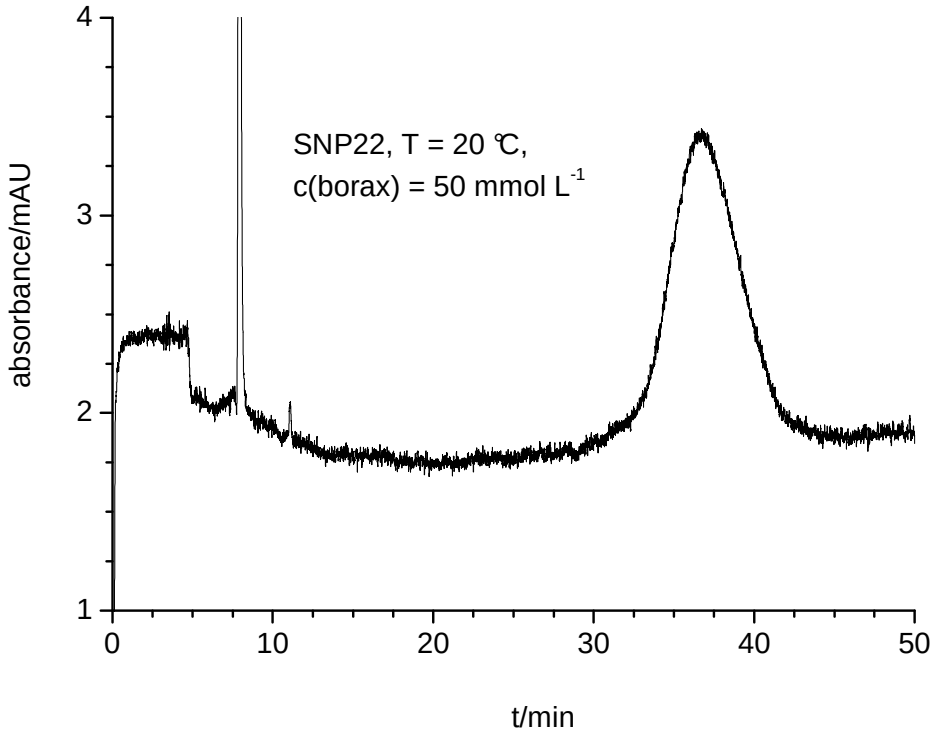

SNP12, T = 25 ℃,
c(borax) = 50 mmol L-1
absorbance/mAU
t/min
1
2
3
4
0
5
10
15
20
25
30
35
40

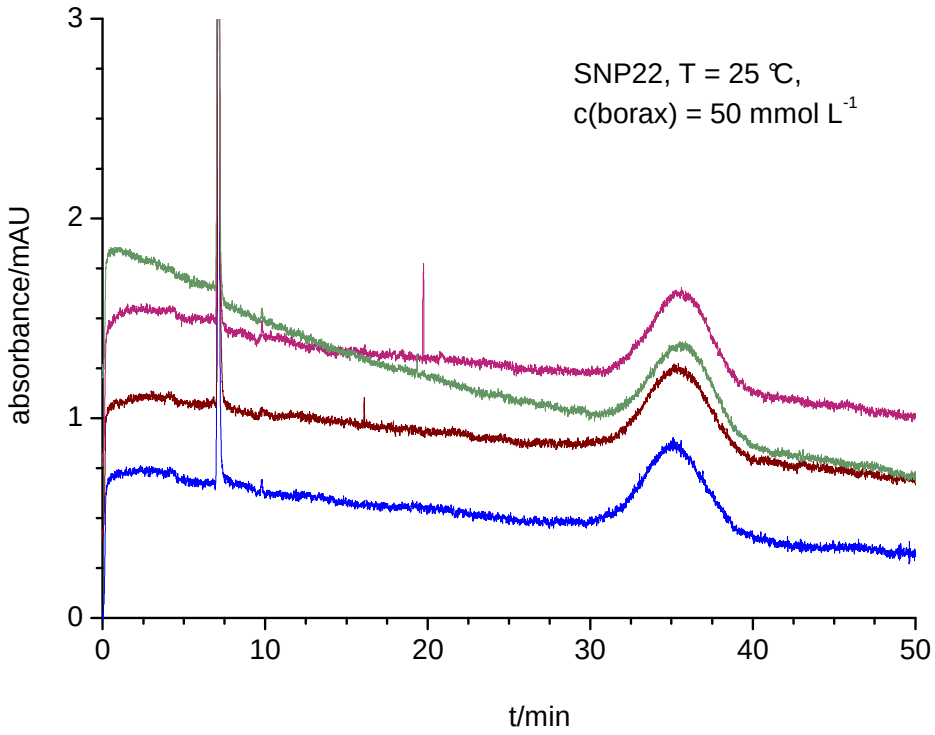

SNP12, T = 25 ℃,
c(borax) = 50 mmol L-1
absorbance/mAU
t/min
4
5
6
7
8
0
5
10
15
20
25
30
35
40

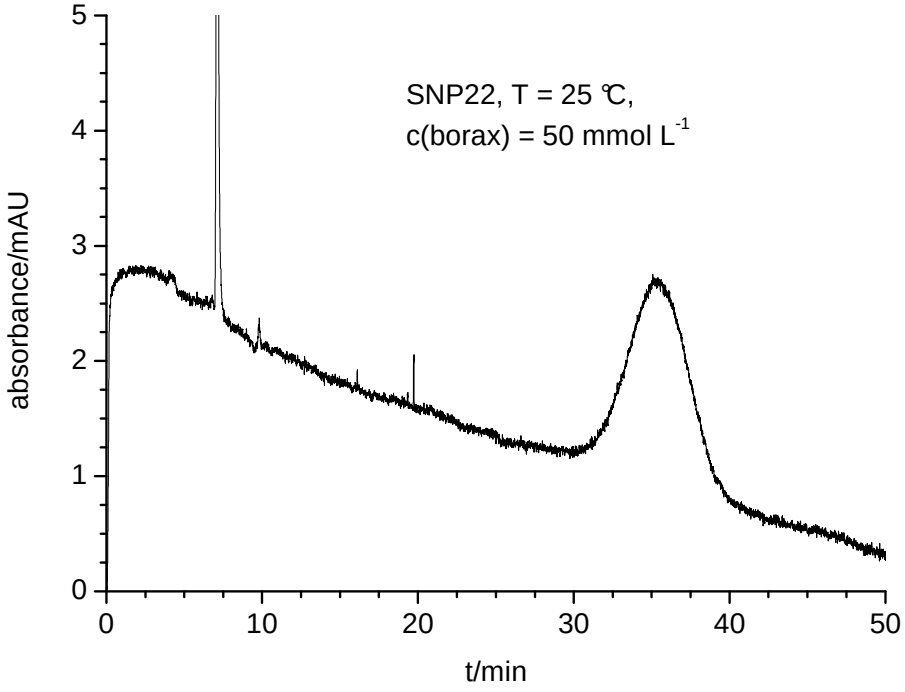

SNP22, T = 15 ℃,
c(borax) = 50 mmol L-1
absorbance/mAU
t/min
0
1
2
0
10
20
30
40
50
60

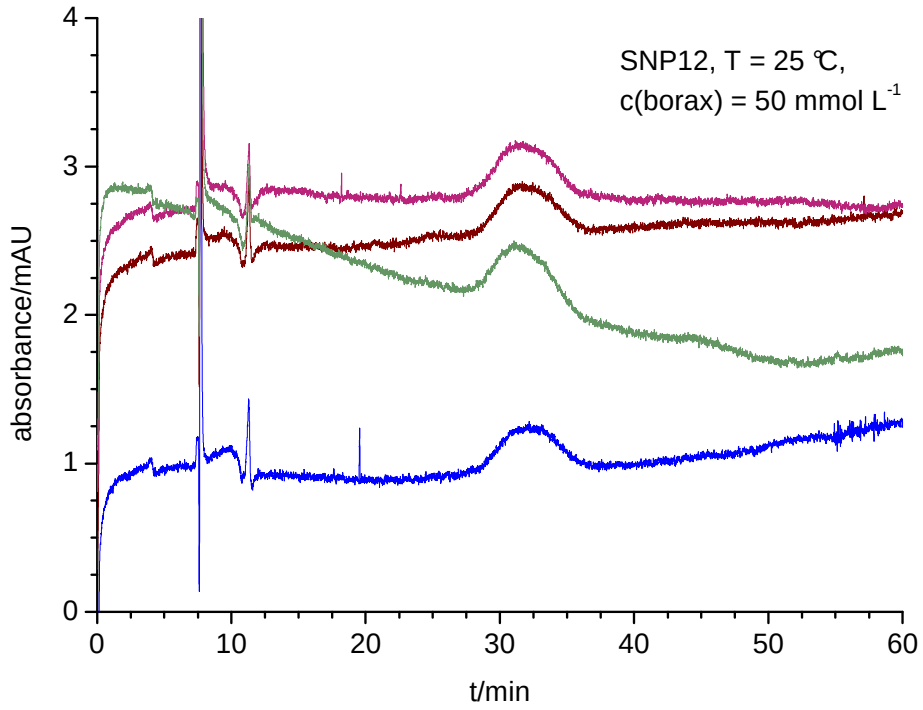

SNP22, T = 15 ℃,
c(borax) = 50 mmol L-1
absorbance/mAU
t/min
0
1
2
0
10
20
30
40
50
60

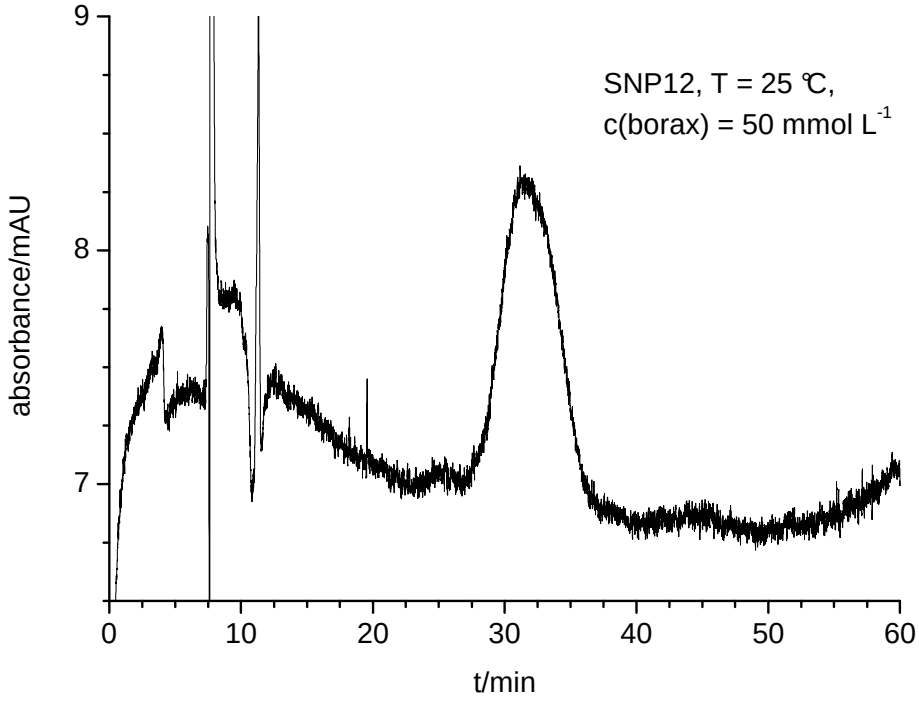

SNP22, T = 20 ℃,
c(borax) = 50 mmol L-1
absorbance/mAU
t/min
0
1
2
3
0
10
20
30
40
50

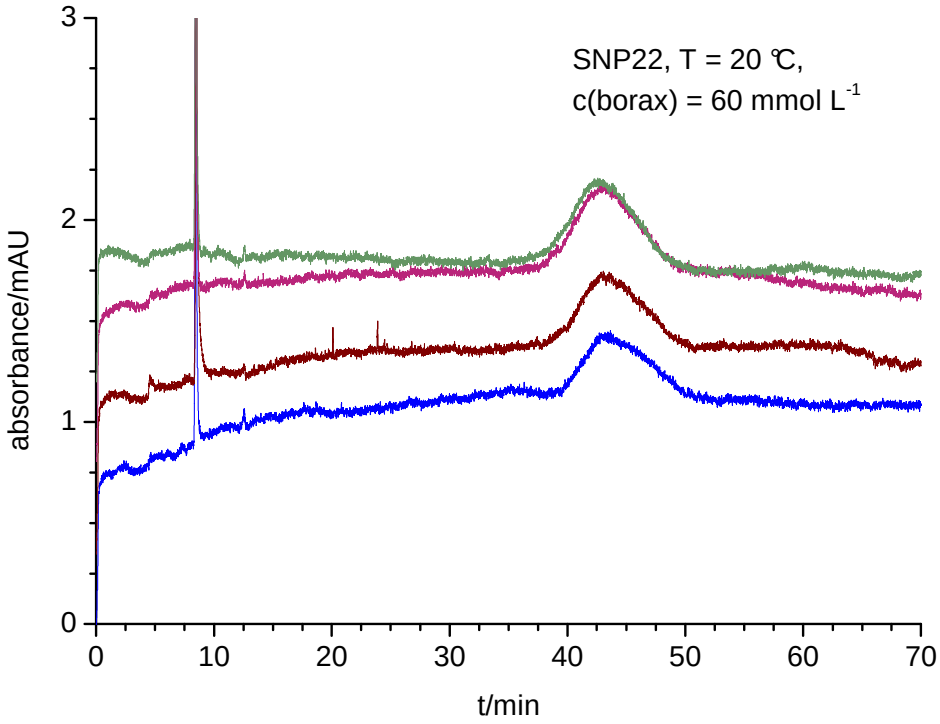

SNP22, T = 20 ℃,
c(borax) = 50 mmol L-1
absorbance/mAU
t/min
1
2
3
4
0
10
20
30
40
50

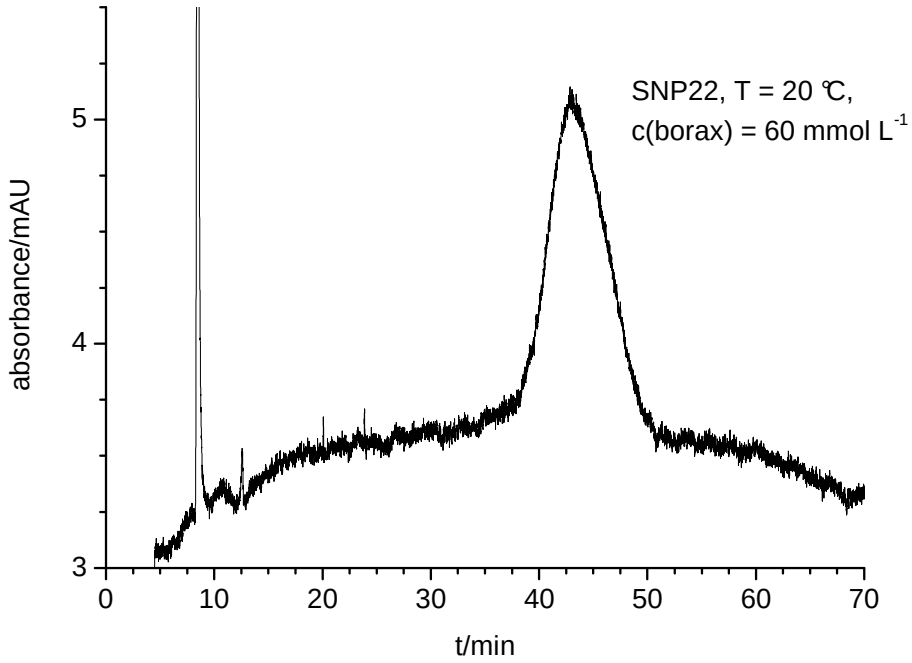

SNP22, T = 25 ℃,
c(borax) = 50 mmol L-1
absorbance/mAU
t/min
0
1
2
3
0
10
20
30
40
50

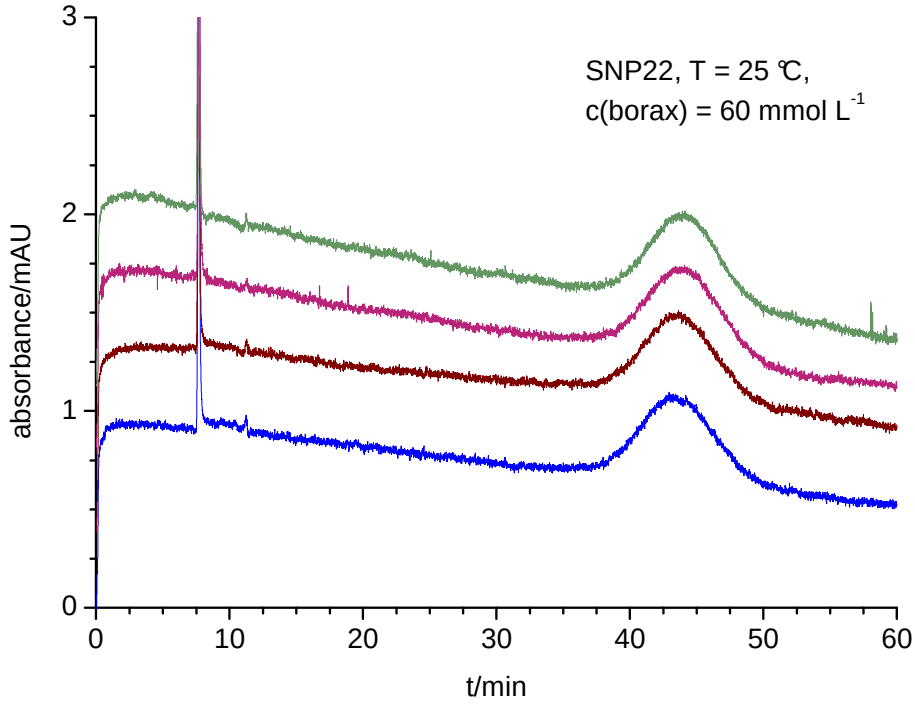

SNP22, T = 25 ℃,
c(borax) = 50 mmol L-1
absorbance/mAU
t/min
0
1
2
3
4
5
0
10
20
30
40
50


SNP12, T = 25 ℃,
c(borax) = 50 mmol L-1
absorbance/mAU
t/min
0
1
2
3
4
0
10
20
30
40
50
60


SNP12, T = 25 ℃,
c(borax) = 50 mmol L-1
absorbance/mAU
t/min
7
8
9
0
10
20
30
40
50
60


SNP22, T = 20 ℃,
c(borax) = 60 mmol L-1
absorbance/mAU
t/min
0
1
2
3
0
10
20
30
40
50
60
70


SNP22, T = 20 ℃,
c(borax) = 60 mmol L-1
absorbance/mAU
t/min
3
4
5
0
10
20
30
40
50
60
70


SNP22, T = 25 ℃,
c(borax) = 60 mmol L-1
absorbance/mAU
t/min
0
1
2
3
0
10
20
30
40
50
60

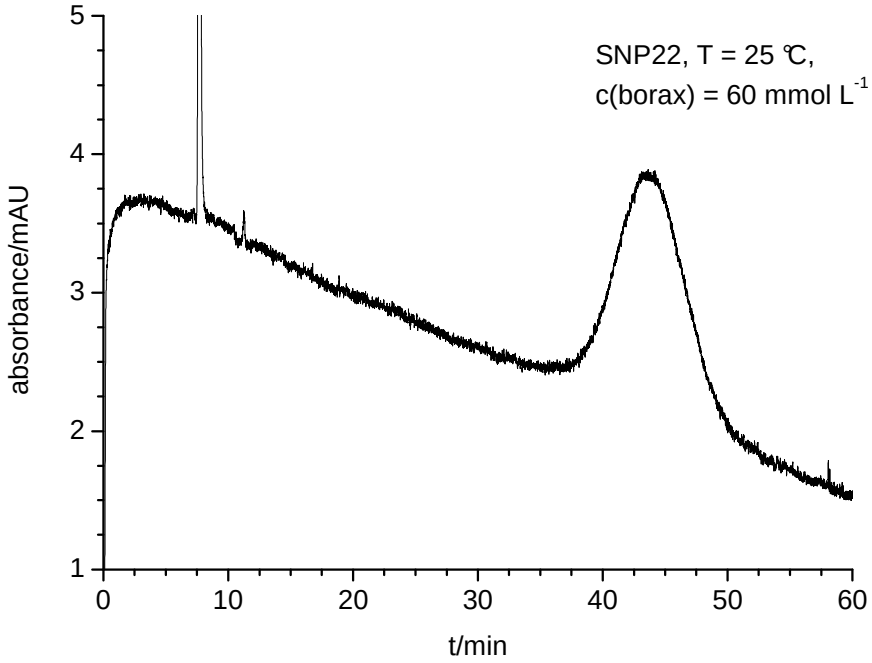
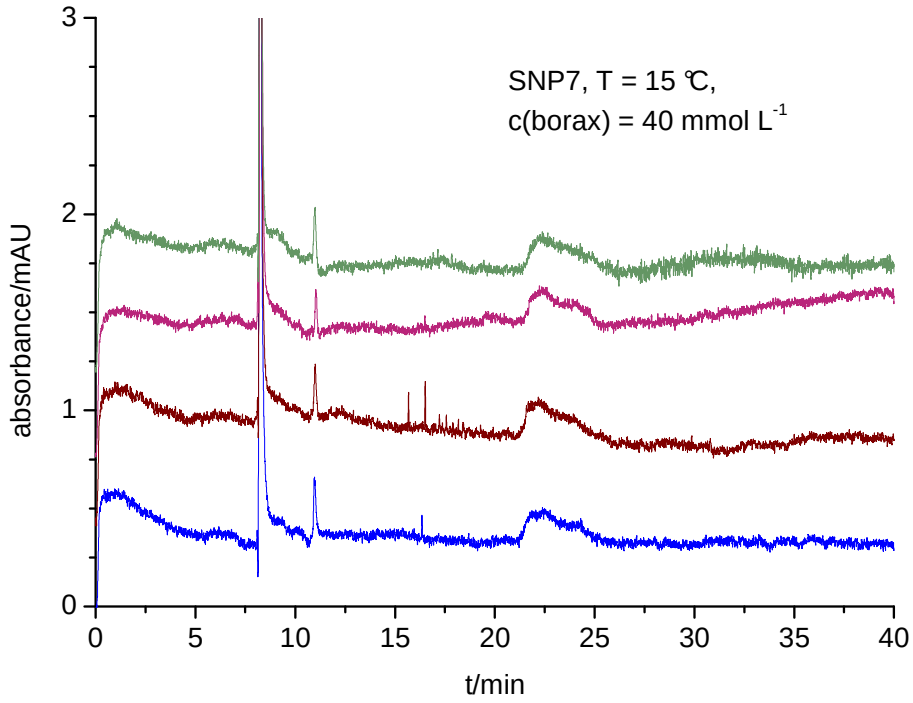
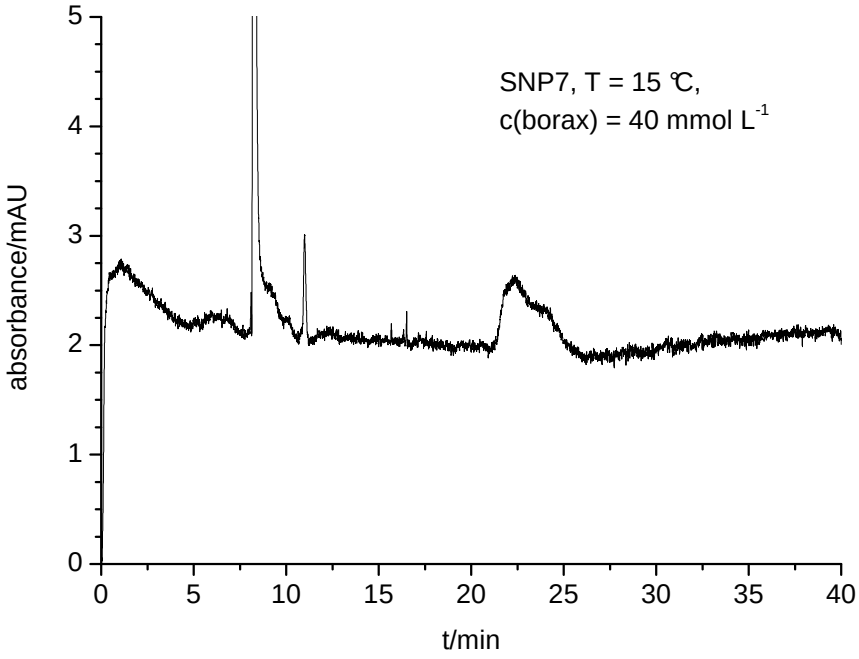
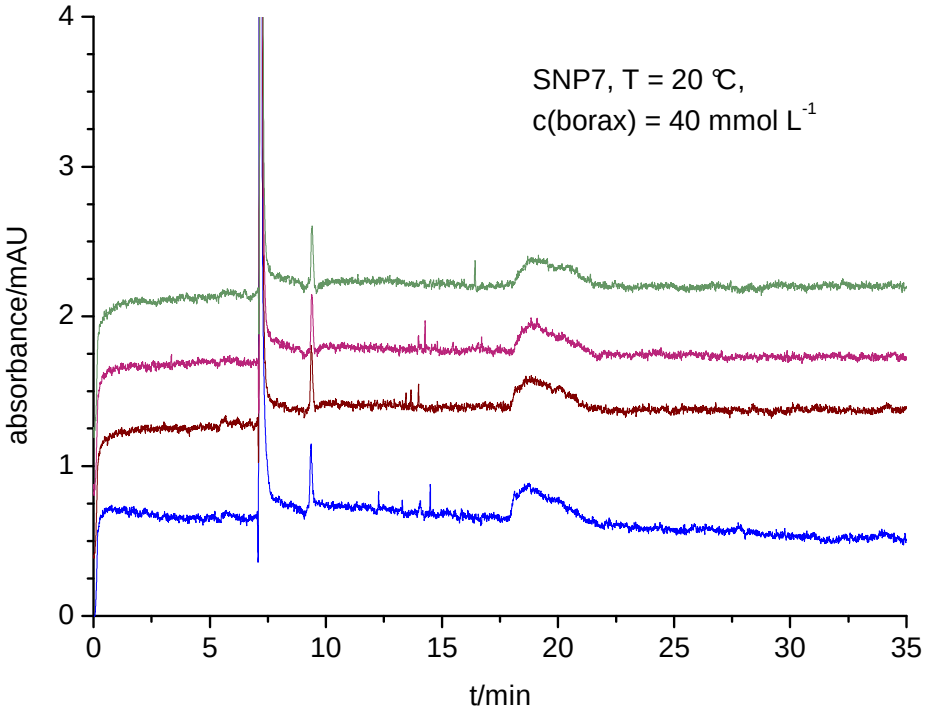
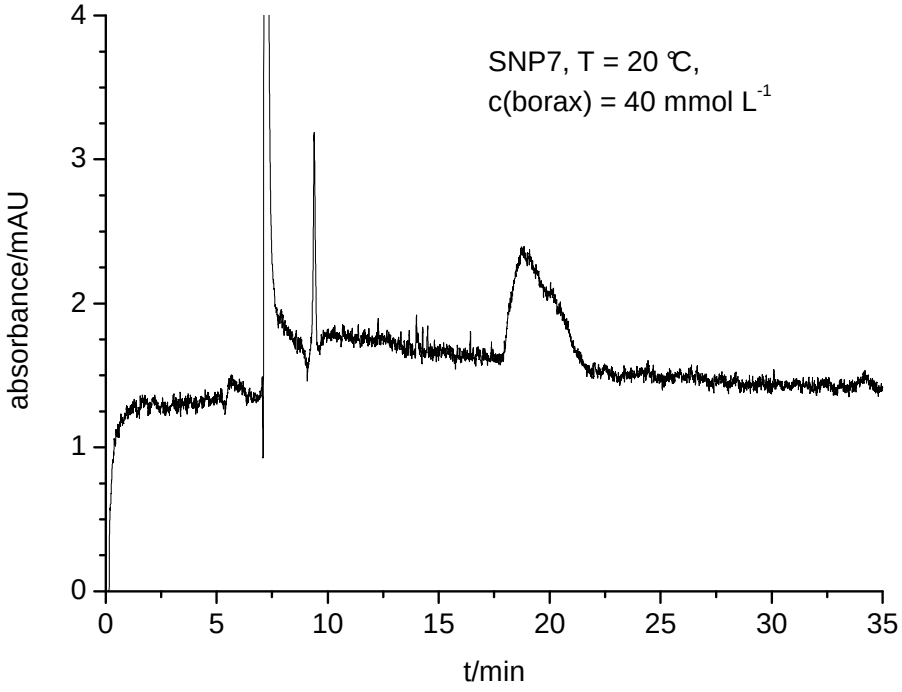

SNP22, T = 25 ℃,
c(borax) = 60 mmol L-1
absorbance/mAU
t/min
1
2
3
4
5
0
10
20
30
40
50
60

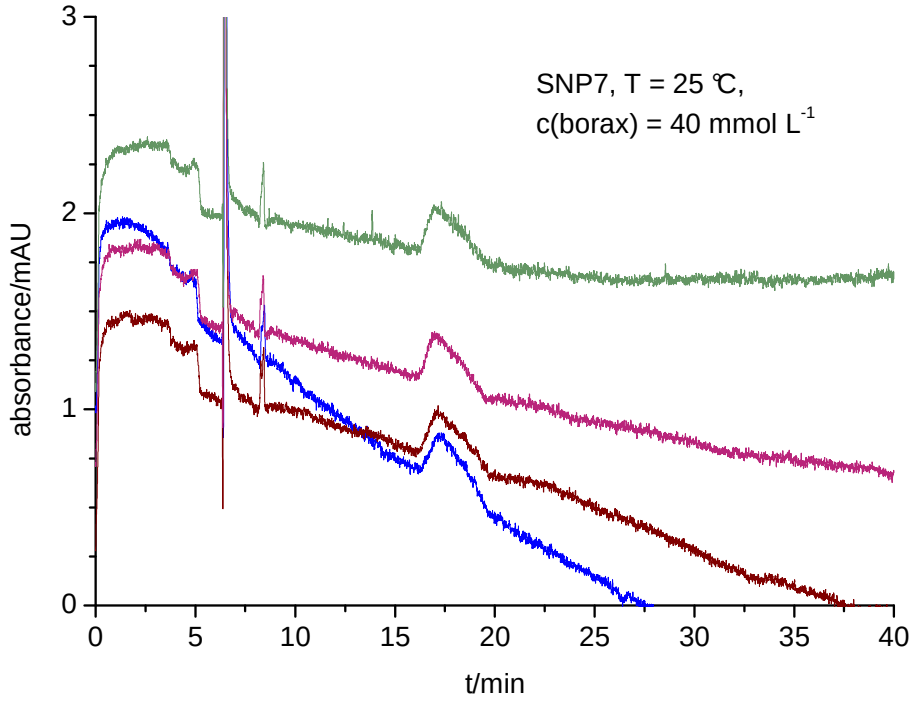
Figure S9. For SNP12 and SNP22 comparison of superimposed electropherograms obtained in consecutive runs (colored lines) with electropherogram calculated from added traces (black line). Experimental conditions: T see figure inset, total length of capillary = 395 mm, capillary length to detector = 292 mm, inner diameter of fused silica capillary = 75 μm, separation electrolyte borax in water (pH = 9.2), separation voltage 7 kV, data rate 16 Hz (moving average 16 points), absorbance detection 200 nm (SNP12) or 214 nm (SNP22). Sample injection parameters: (a, SNP12, c(borax) = 20 mmol L^{-1}) 0.2 psi (13.78 mbar) 6 s, (b, SNP22, c(borax) = 20 mmol L^{-1}) 0.1 psi (6.89 mbar) 6 s, (c, SNP12, c(borax) = 30 mmol L^{-1}) 0.2 psi (13.78 mbar) 6 s, (d, SNP22, c(borax) = 30 mmol L^{-1}) 0.1 psi (6.89 mbar) 6 s, (e, SNP12, c(borax) = 40 mmol L^{-1}) 0.2 psi (13.78 mbar) 6 s, (f, SNP22, c(borax) = 40 mmol L^{-1}) 0.1 psi (6.89 mbar) 6 s, (g, SNP12, c(borax) = 50 mmol L^{-1}) 0.2 psi (13.78 mbar) 9 s, (h, SNP22, c(borax) = 50 mmol L^{-1}) 0.1 psi (6.89 mbar) 9 s, (i, SNP12, c(borax) = 60 mmol L^{-1}) 0.2 psi (13.78 mbar) 12 s, (j, SNP22, c(borax) = 60 mmol L^{-1}) 0.2 psi (13.78 mbar) 6 s.

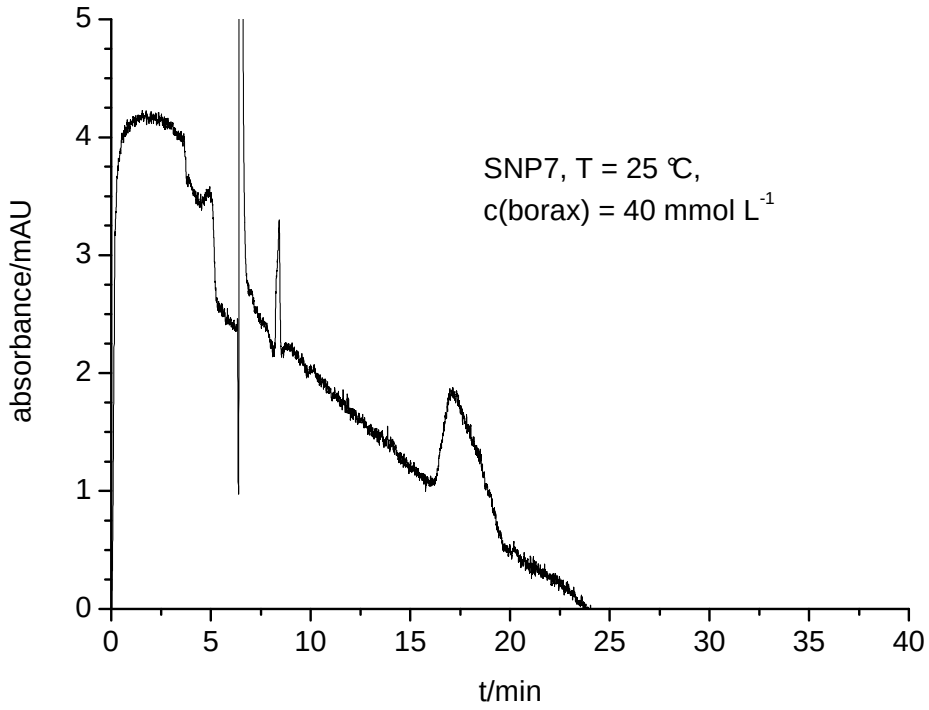

SNP7, T = 15 ℃,
c(borax) = 40 mmol L-1
absorbance/mAU
t/min
0
1
2
3
0
5
10
15
20
25
30
35
40

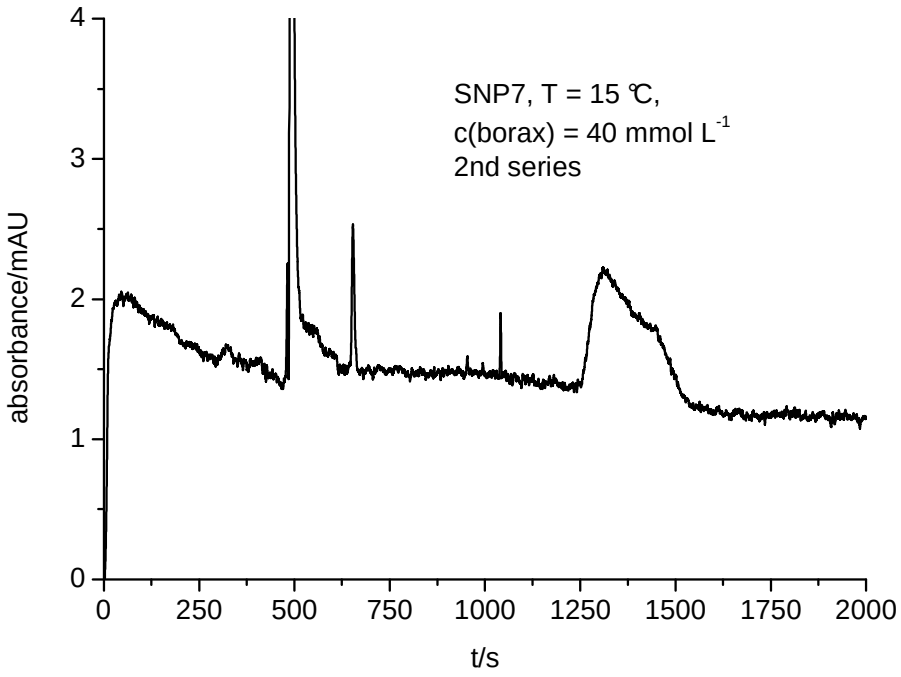

SNP7, T = 15 ℃,
c(borax) = 40 mmol L-1
absorbance/mAU
t/min
0
1
2
3
4
5
0
5
10
15
20
25
30
35
40

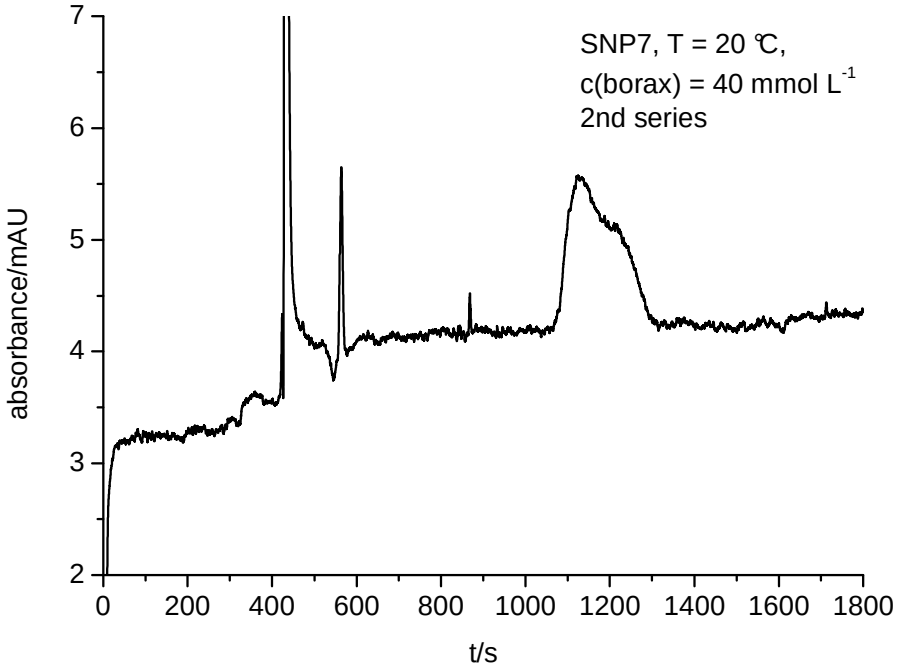

SNP7, T = 20 ℃,
c(borax) = 40 mmol L-1
absorbance/mAU
t/min
0
1
2
3
4
0
5
10
15
20
25
30
35


SNP7, T = 20 ℃,
c(borax) = 40 mmol L-1
absorbance/mAU
t/min
0
1
2
3
4
0
5
10
15
20
25
30
35


SNP7, T = 25 ℃,
c(borax) = 40 mmol L-1
absorbance/mAU
t/min
0
1
2
3
0
5
10
15
20
25
30
35
40


SNP7, T = 25 ℃,
c(borax) = 40 mmol L-1
absorbance/mAU
t/min
0
1
2
3
4
5
0
5
10
15
20
25
30
35
40


SNP7, T = 15 ℃,
c(borax) = 40 mmol L-1
2nd series
absorbance/mAU
t/s
0
1
2
3
4
0
250
500
750
1000
1250
1500
1750
2000


SNP7, T = 20 ℃,
c(borax) = 40 mmol L-1
2nd series
absorbance/mAU
t/s
2
3
4
5
6
7
0
200
400
600
800
1000
1200
1400
1600
1800

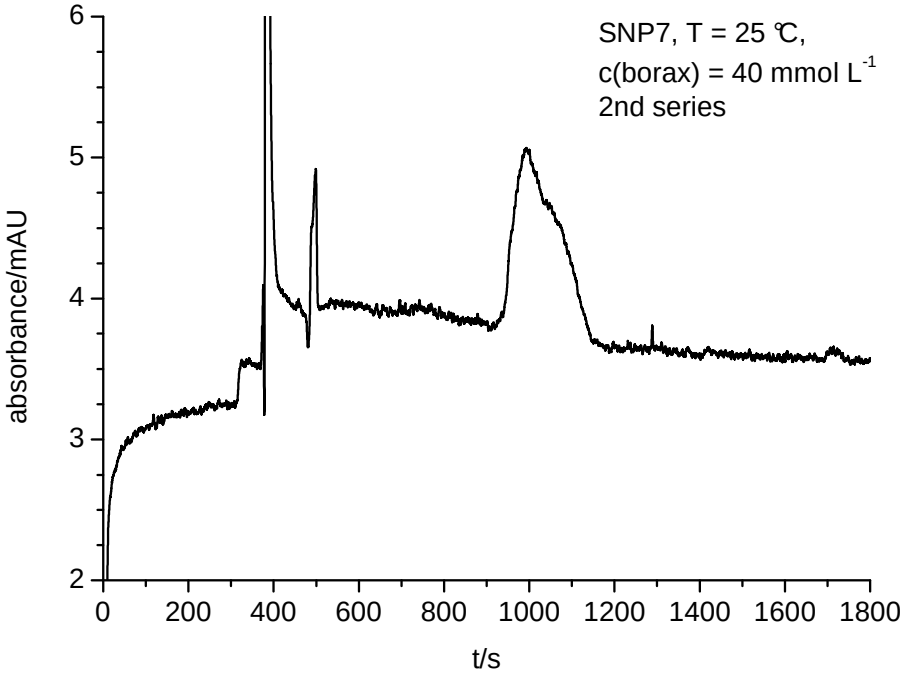


Figure S10. For SNP7 (first series) comparison of superimposed electropherograms obtained in consecutive runs (colored lines) with electropherogram calculated from added traces (black line). Experimental conditions: T see figure inset, total length of capillary = 395 mm, capillary length to detector = 292 mm, inner diameter of fused silica capillary = 75 μm, separation electrolyte borax in water (pH = 9.2), separation voltage 7 kV, data rate 16 Hz (moving average 16 points), absorbance detection 200 nm. Sample injection parameters: (a, first series) 0.1 psi (6.89 mbar) 6 s, (b, second series) 0.2 psi (13.78 mbar) 6 s. Second series: smoothed cumulative superposition of four traces Savitzky Golay algorithm 40 points.

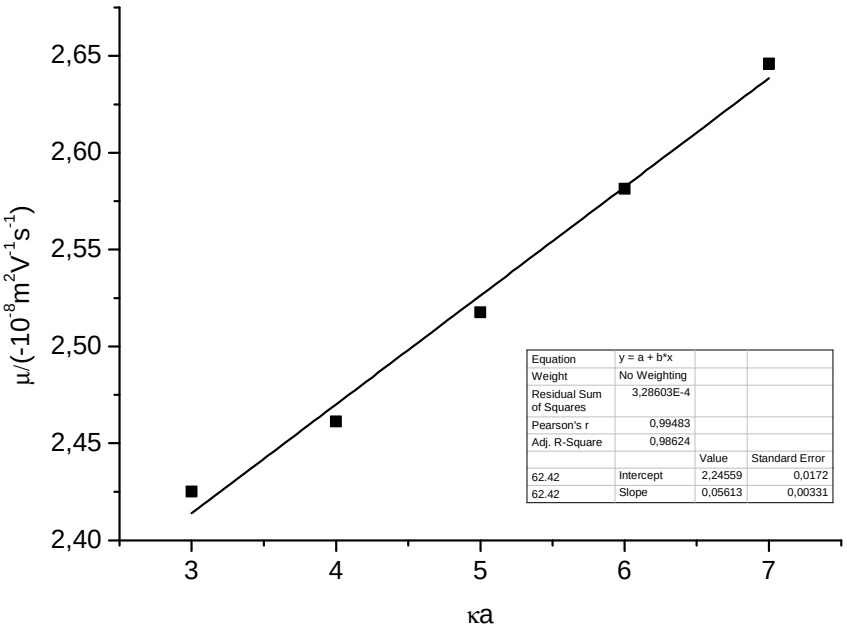


Figure S11a. Regression line for SNP12, T = 15 °C, c(borax) = 20 mmol L^{-1}.

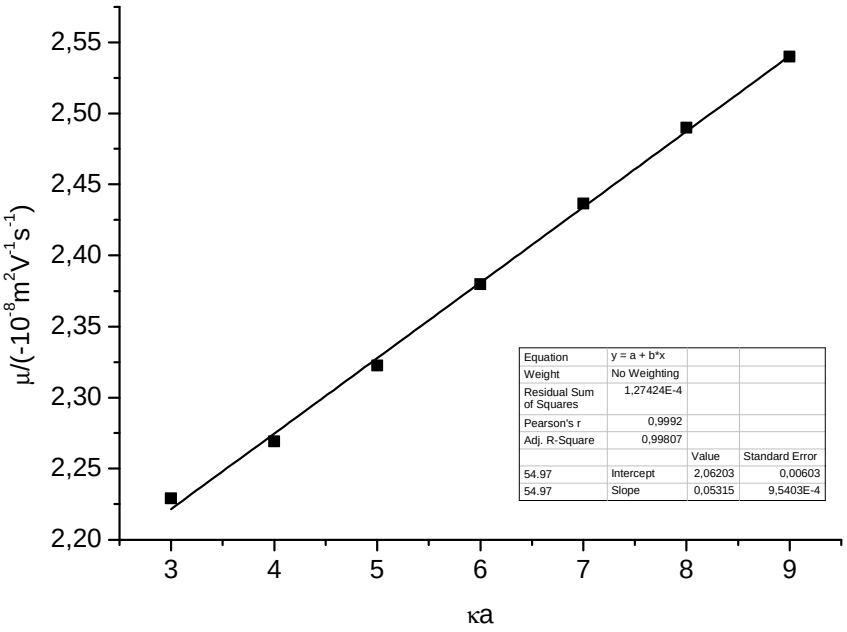


Figure S11b. Regression line for SNP12, T = 15 °C, c(borax) = 30 mmol L^{-1}.

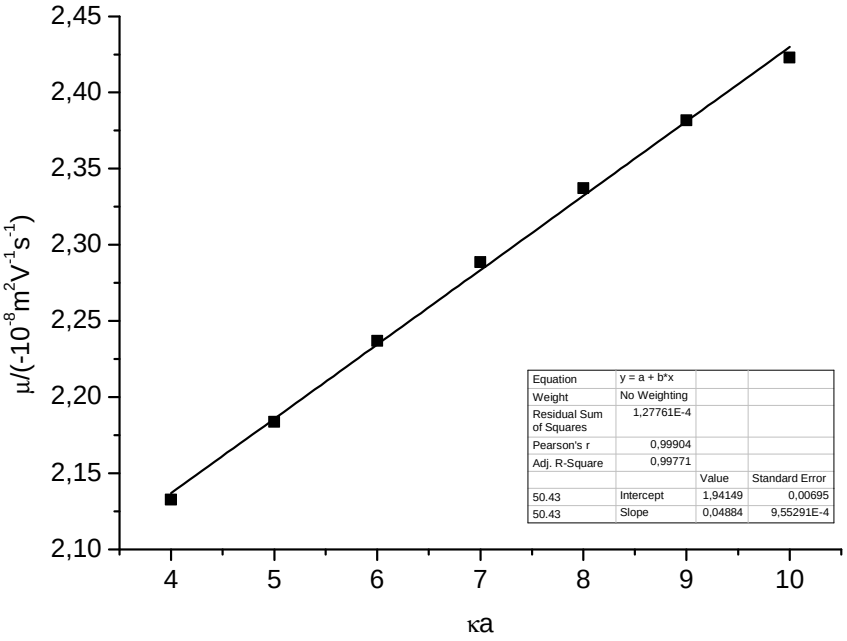


Figure S11c. Regression line for SNP12, T = 15 °C, c(borax) = 40 mmol L^{-1}.

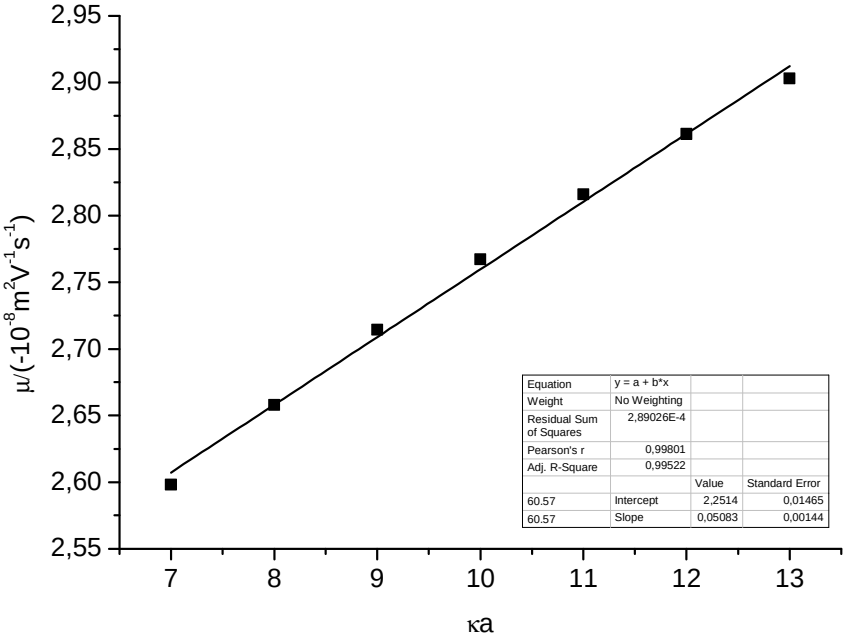


Figure S11d. Regression line for SNP22, T = 15 °C, c(borax) = 20 mmol L^{-1}.

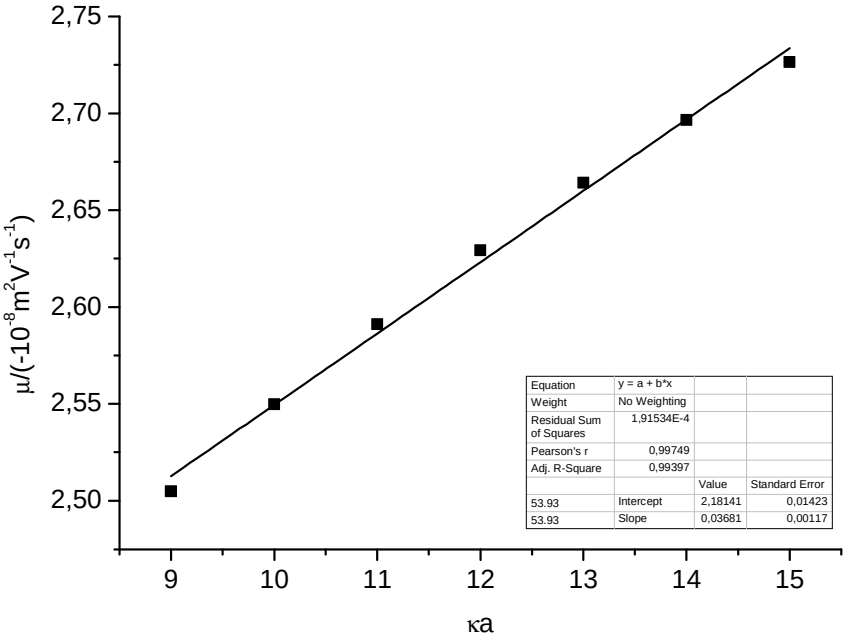


Figure S11e. Regression line for SNP22, T = 15 °C, c(borax) = 30 mmol L^{-1}.

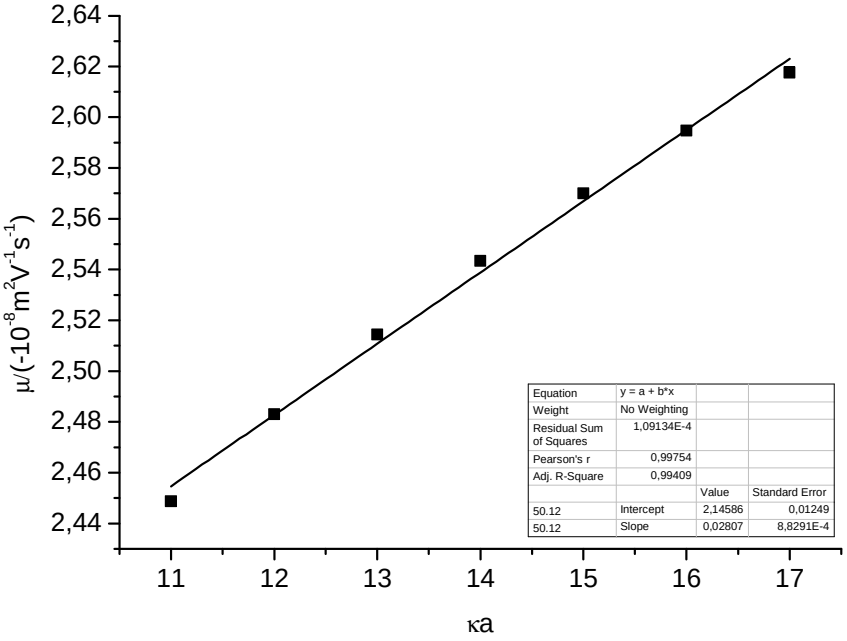


Figure S11f. Regression line for SNP22, T = 15 °C, c(borax) = 40 mmol L^{-1}.

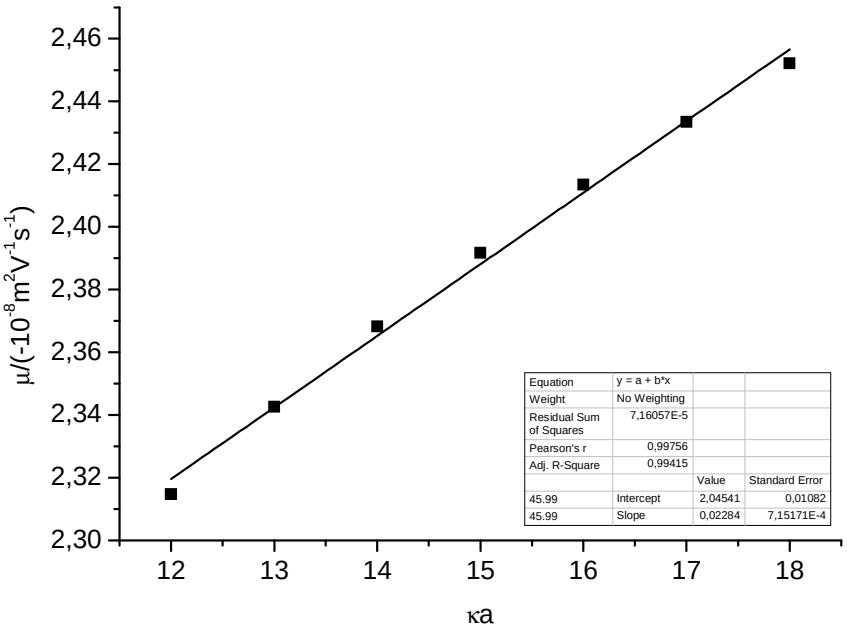


Figure S11g. Regression line for SNP22, T = 15 °C, c(borax) = 50 mmol L^{-1}.

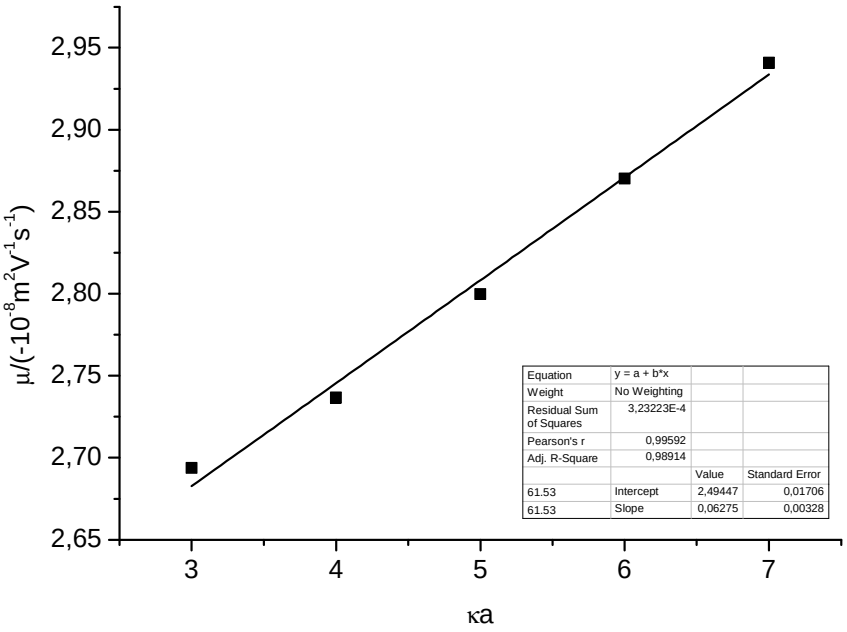


Figure S11h. Regression line for SNP12, T = 20 °C, c(borax) = 20 mmol L^{-1}.

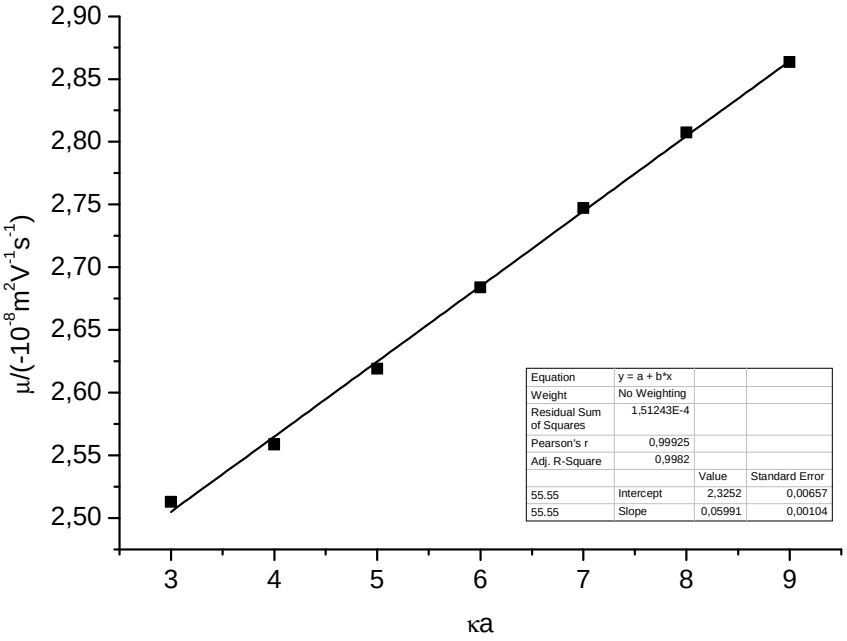


Figure S11i. Regression line for SNP12, T = 20 °C, c(borax) = 30 mmol L^{-1}.

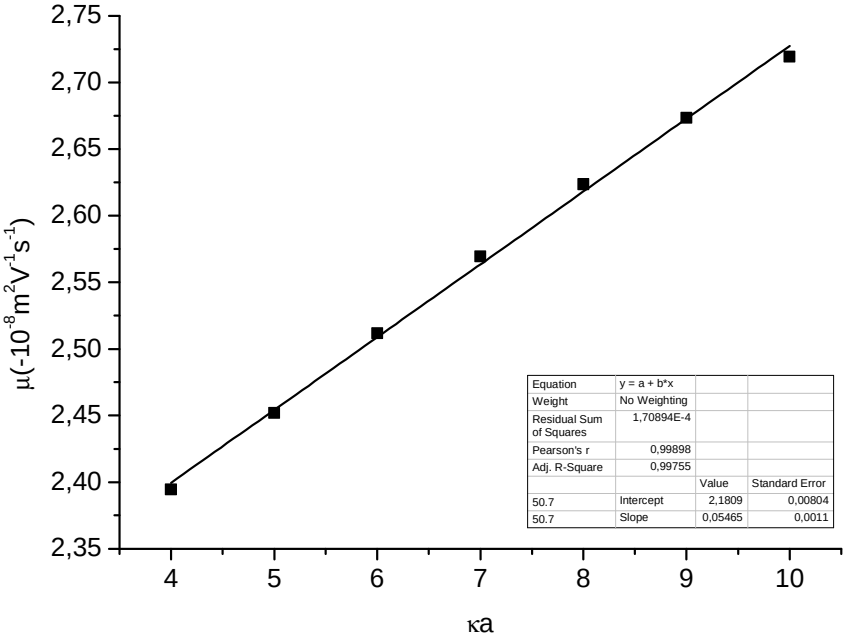


Figure S11j. Regression line for SNP12, T = 20 °C, c(borax) = 40 mmol L^{-1}.

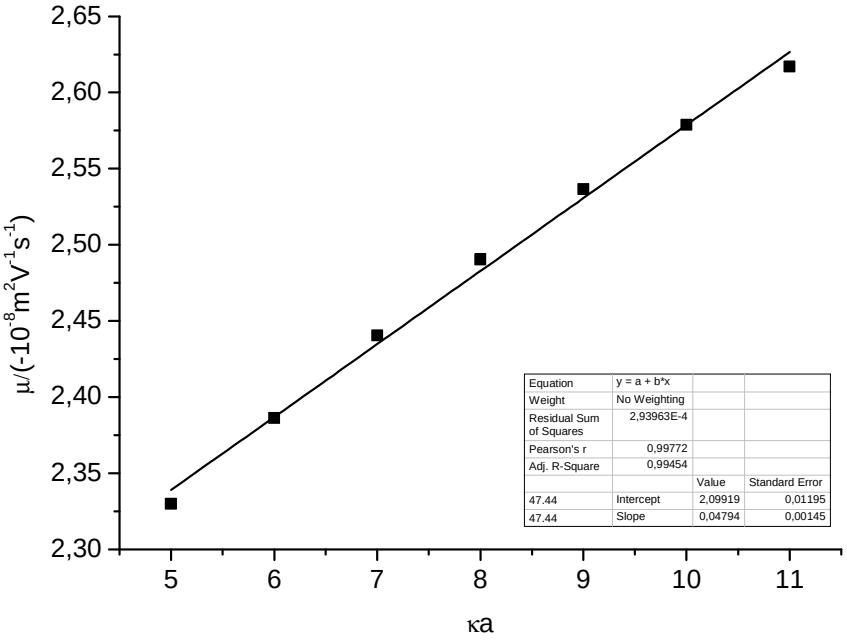


Figure S11k. Regression line for SNP12, T = 20 °C, c(borax) = 50 mmol L^{-1}.

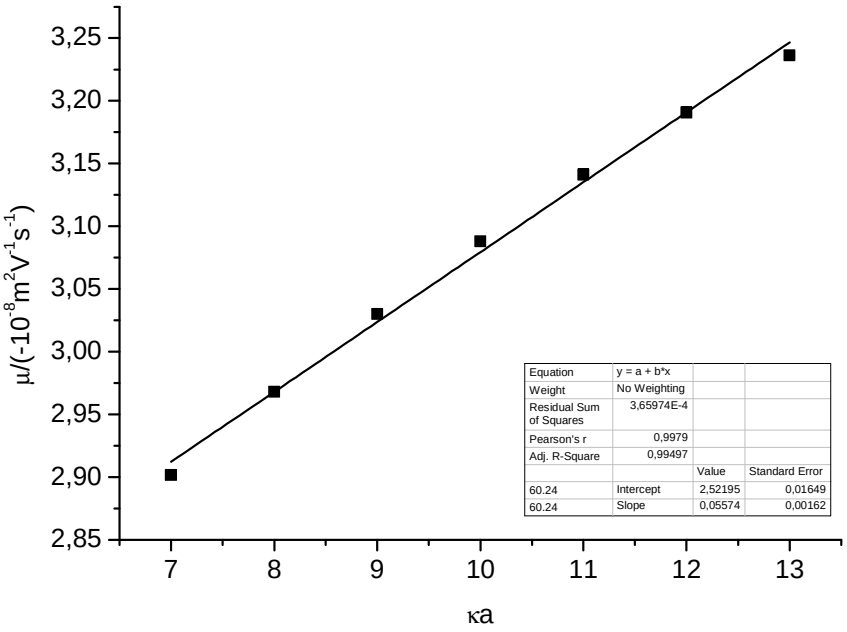


Figure S11l. Regression line for SNP22, T = 20 °C, c(borax) = 20 mmol L^{-1}.

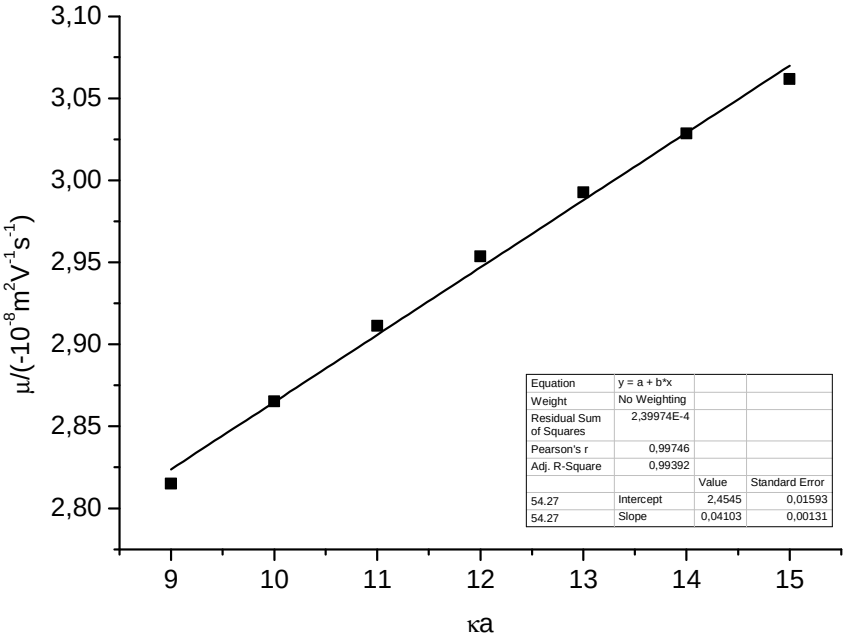


Figure S11m. Regression line for SNP22, T = 20 °C, c(borax) = 30 mmol L^{-1}.

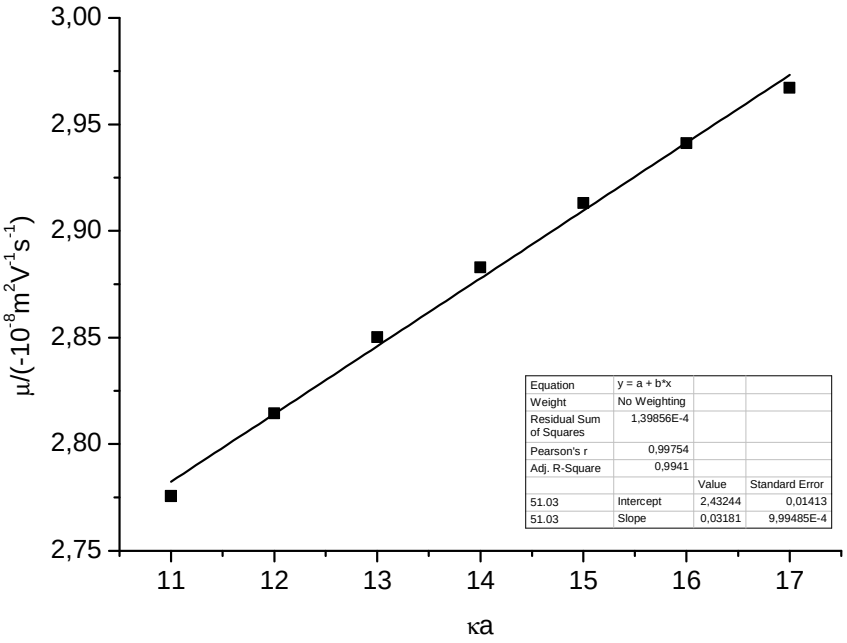


Figure S11n. Regression line for SNP22, T = 20 °C, c(borax) = 40 mmol L^{-1}.

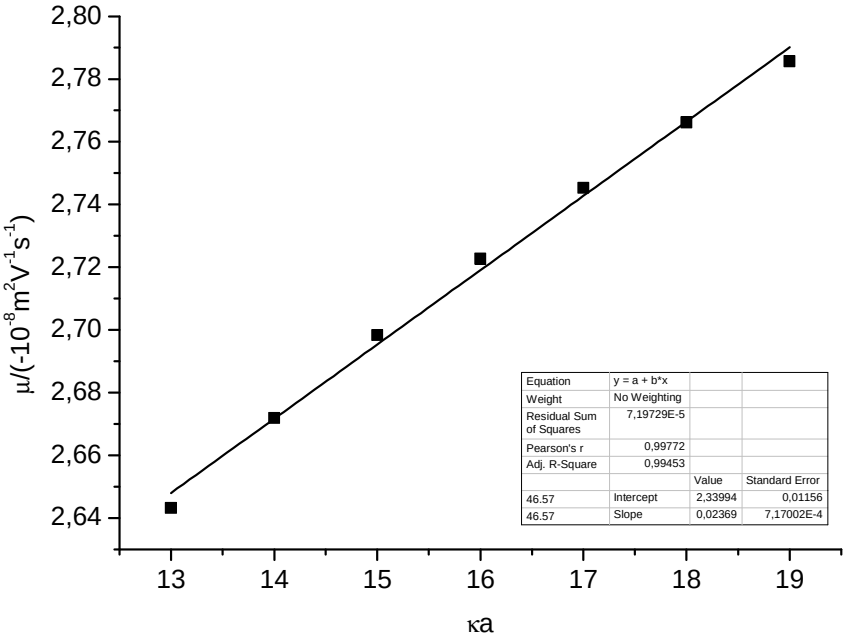


Figure S11o. Regression line for SNP22, T = 20 °C, c(borax) = 50 mmol L^{-1}.

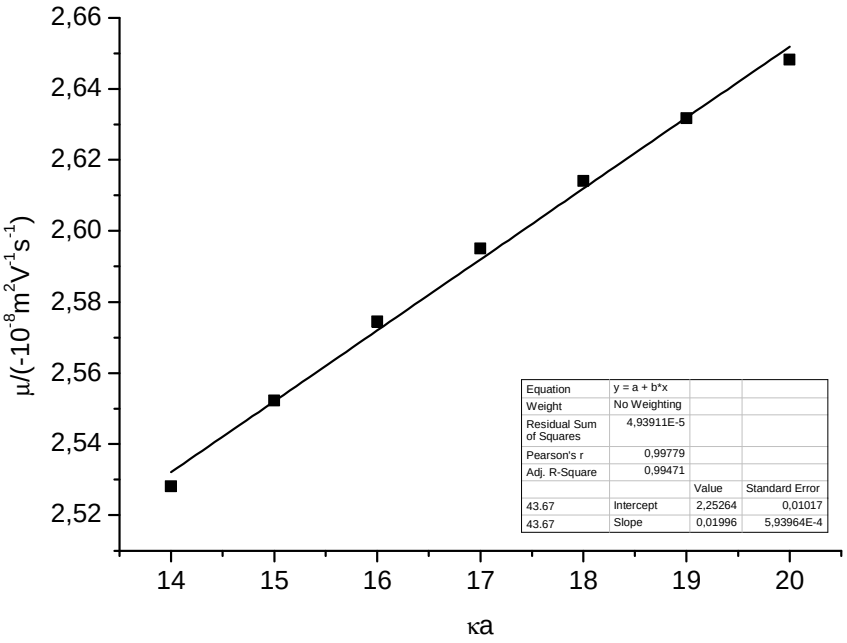


Figure S11p. Regression line for SNP22, T = 20 °C, c(borax) = 60 mmol L^{-1}.

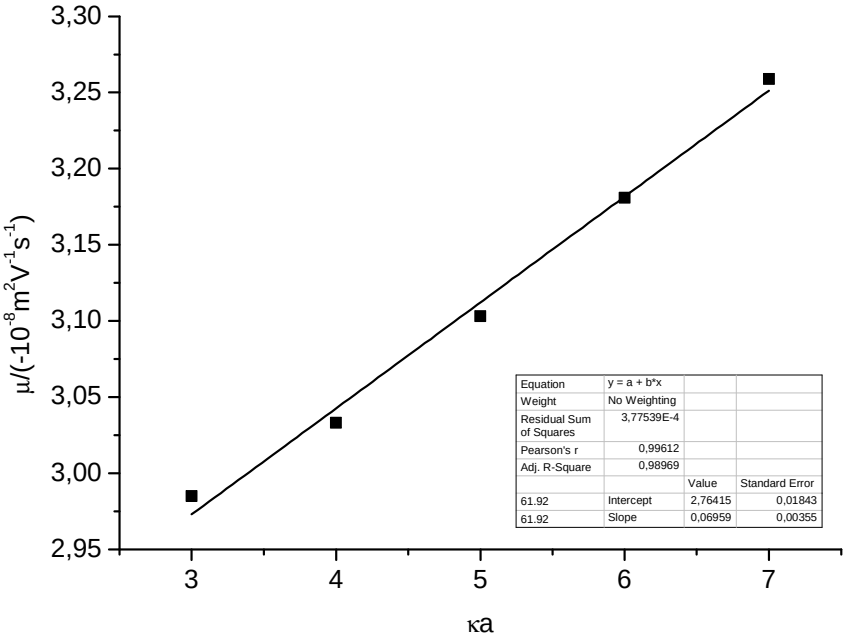


Figure S11q. Regression line for SNP12, T = 25 °C, c(borax) = 20 mmol L^{-1}.

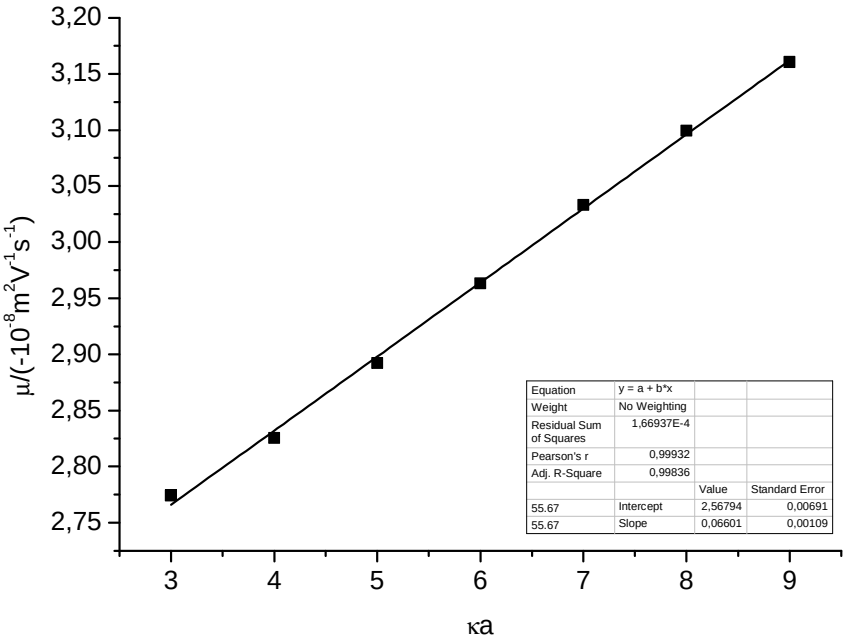


Figure S11r. Regression line for SNP12, T = 25 °C, c(borax) = 30 mmol L^{-1}.

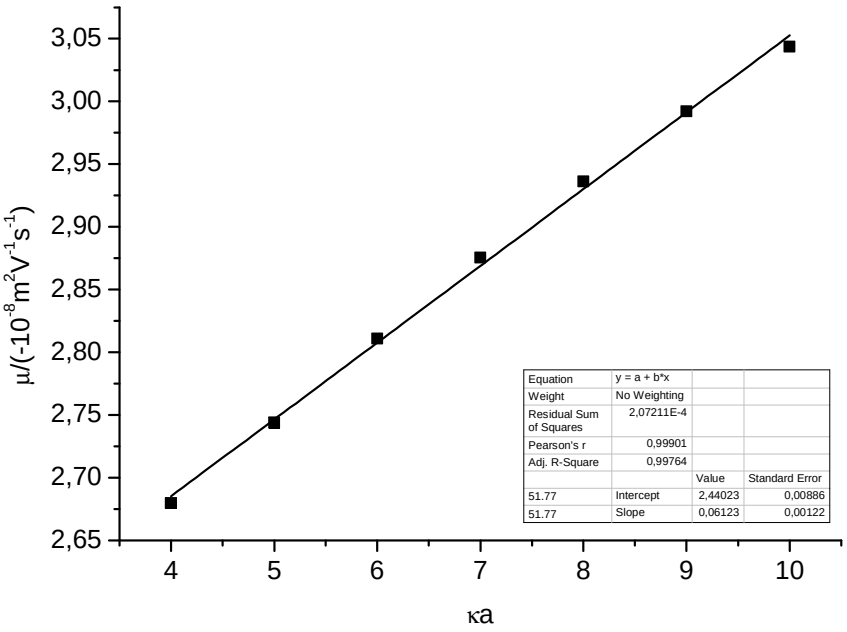


Figure S11s. Regression line for SNP12, T = 25 °C, c(borax) = 40 mmol L^{-1}.

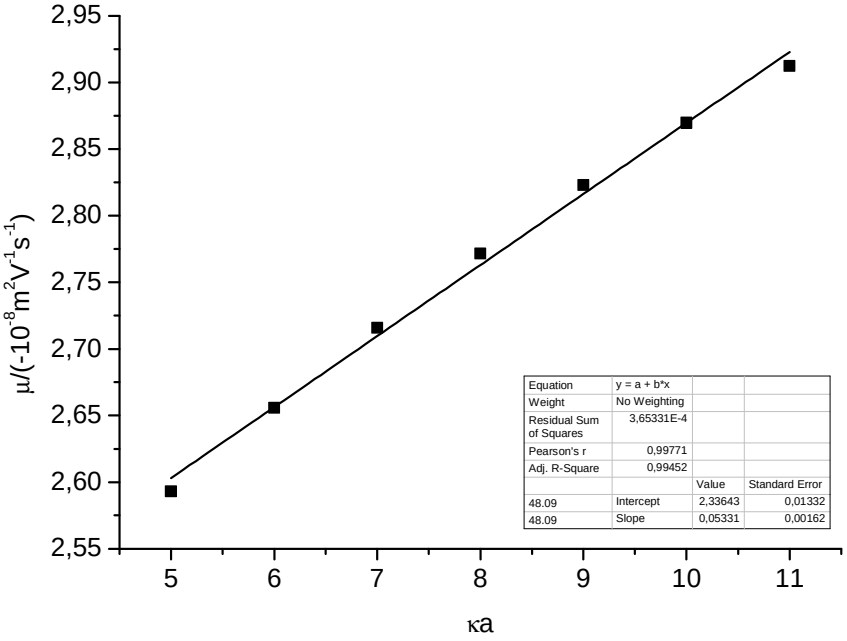


Figure S11t. Regression line for SNP12, T = 25 °C, c(borax) = 50 mmol L^{-1}.

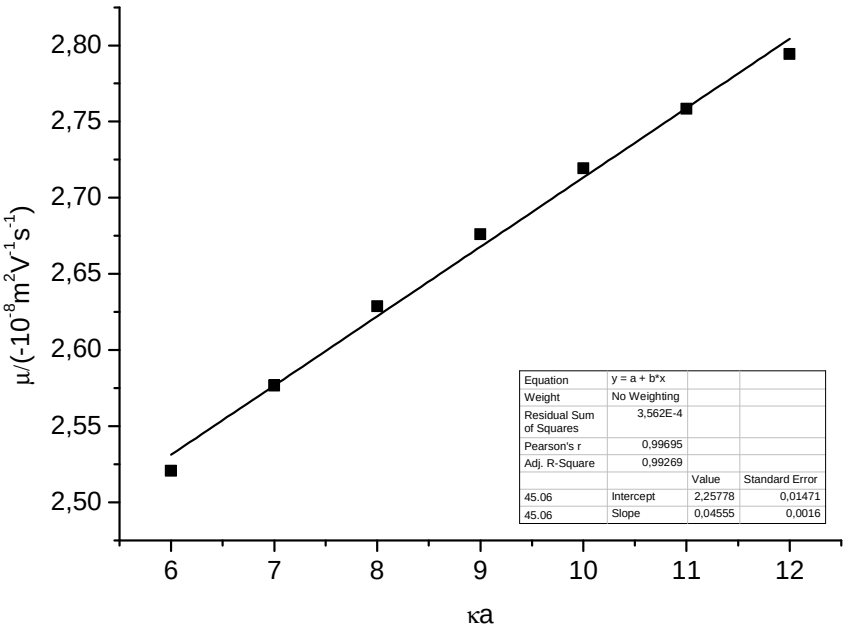


Figure S11u. Regression line for SNP12, T = 25 °C, c(borax) = 60 mmol L^{-1}.

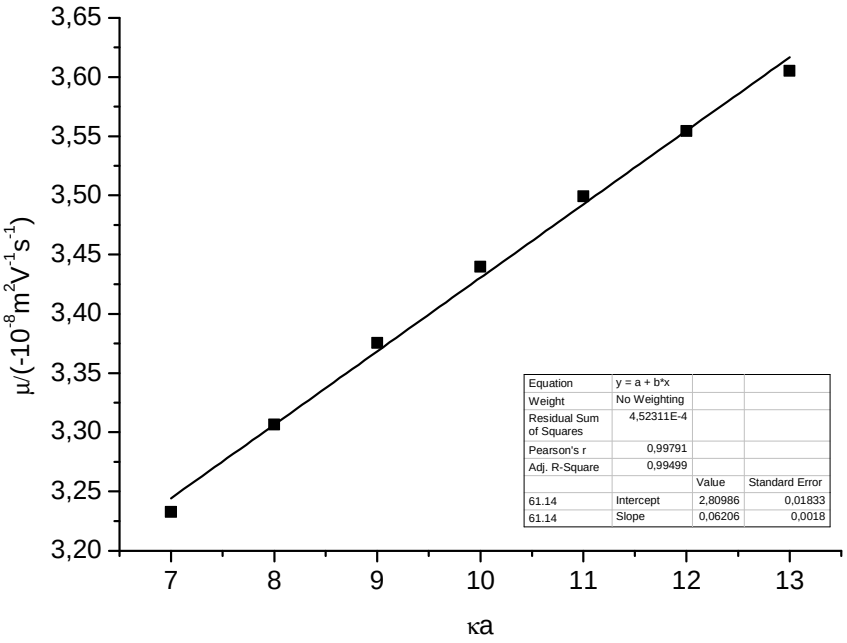


Figure S11v. Regression line for SNP22, T = 25 °C, c(borax) = 20 mmol L^{-1}.

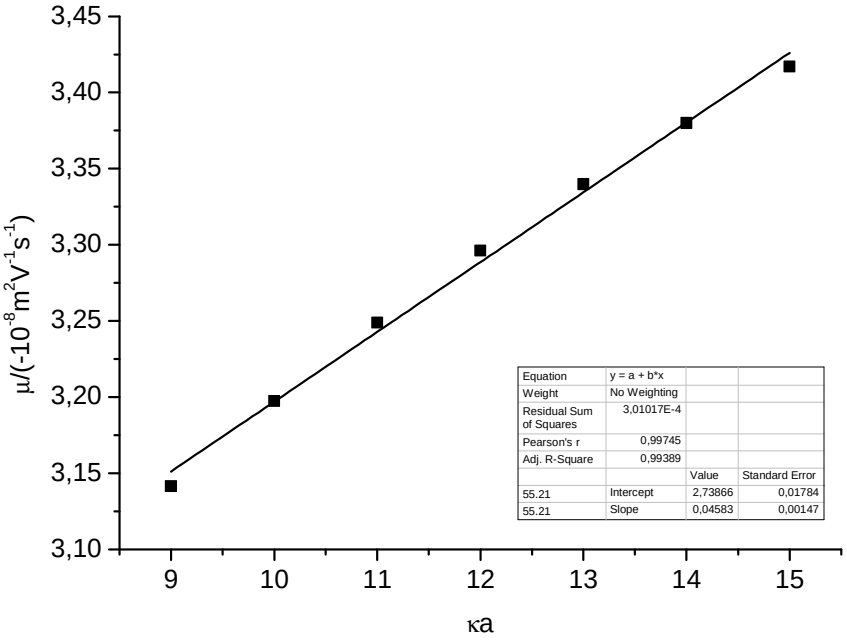


Figure S11w. Regression line for SNP22, T = 25 °C, c(borax) = 30 mmol L^{-1}.

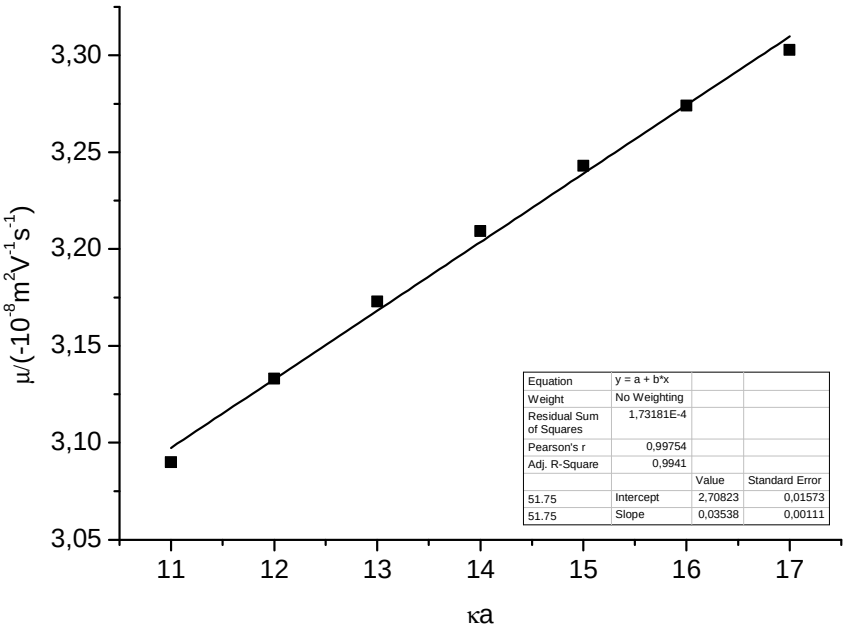


Figure S11x. Regression line for SNP22, T = 25 °C, c(borax) = 40 mmol L^{-1}.

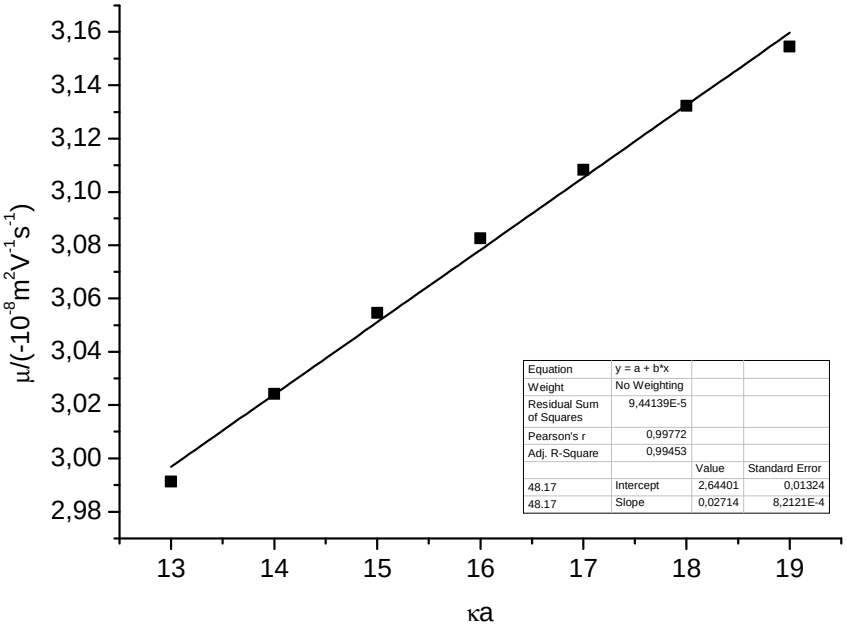


Figure S11y. Regression line for SNP22, T = 25 °C, c(borax) = 50 mmol L^{-1}.

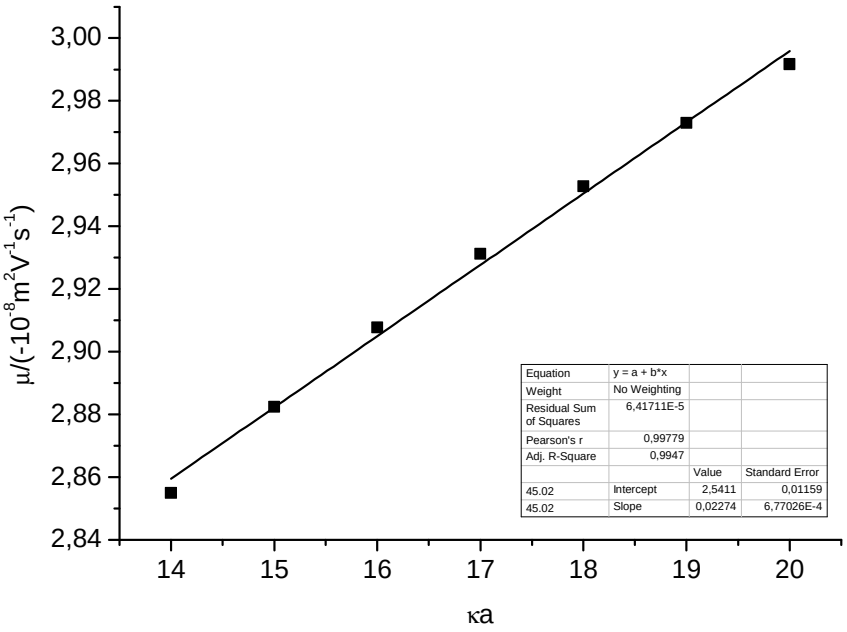


Figure S11z. Regression line for SNP22, T = 25 °C, c(borax) = 60 mmol L^{-1}.

Table S4. Overview on electrophoretic mobilities μ calculated from capillary electrophoresis data (mean values and standard deviation, N = 4, see also Tables S5a-g), for experimental parameters refer to Figure 3. The corresponding electropherograms are given in Figure S9.

Buffer concentration, temperature	SNP12 μ/(mm^2 kV^{-1} s^{-1})	SNP22 μ/(mm^2 kV^{-1} s^{-1})
c(borax) = 20 mmol L^{-1}, T = 15 °C	-25.42 (± 0.057)	-27.65 (± 0.019)
c(borax) = 20 mmol L^{-1}, T = 20 °C	-28.28 (± 0.078)	-30.88 (± 0.014)
c(borax) = 20 mmol L^{-1}, T = 25 °C	-31.36 (± 0.009)	-34.42 (± 0.041)
1st series		
c(borax) = 30 mmol L^{-1}, T = 15 °C	-24.14 (± 0.035)	-26.36 (± 0.026)
c(borax) = 30 mmol L^{-1}, T = 20 °C	-27.19 (± 0.066)	-29.63 (± 0.030)
c(borax) = 30 mmol L^{-1}, T = 25 °C	-30.09 (± 0.011)	-33.09 (± 0.067)
2nd series		
c(borax) = 30 mmol L^{-1}, T = 15 °C	-24.23 (± 0.040)	-26.31 (± 0.071)
c(borax) = 30 mmol L^{-1}, T = 20 °C	-26.91 (± 0.052)	-29.25 (± 0.044)
c(borax) = 30 mmol L^{-1}, T = 25 °C	-29.88 (± 0.060)	-33.31 (± 0.185)
1st series		
c(borax) = 40 mmol L^{-1}, T = 15 °C	-23.19 (± 0.058)	-25.46
c(borax) = 40 mmol L^{-1}, T = 20 °C	-26.05 (± 0.106)	-28.87 (± 0.058)
c(borax) = 40 mmol L^{-1}, T = 25 °C	-29.25 (± 0.041)	-32.07 (± 0.034)
2nd series		
c(borax) = 40 mmol L^{-1}, T = 15 °C	-23.20 (± 0.047)	-25.23 (± 0.022)
c(borax) = 40 mmol L^{-1}, T = 20 °C	-25.97 (± 0.033)	-28.67 (± 0.038)
c(borax) = 40 mmol L^{-1}, T = 25 °C	-29.17 (± 0.065)	-32.16 (± 0.038)
c(borax) = 50 mmol L^{-1}, T = 15 °C	-22.29	-24.08 (± 0.054)
c(borax) = 50 mmol L^{-1}, T = 20 °C	-25.16 (± 0.119)	-27.18 (± 0.016)
c(borax) = 50 mmol L^{-1}, T = 25 °C	-28.02 (± 0.042)	-30.79 (± 0.101)
c(borax) = 60 mmol L^{-1}, T = 20 °C	--------[a]	-26.01 (± 0.032)
c(borax) = 60 mmol L^{-1}, T = 25 °C	-26.94 (± 0.200)	-29.40 (± 0.080)

[a] not determined

Table S5a. Determined electrophoretic mobilities and ζ potentials **(I = 40 mmol L^{-1})**, for experimental parameters refer to Figures 3 and S9.

NP	Run	μ_{eo}/(mm^2 kV^{-1} s^{-1})	μ_{ep}/(mm^2 kV^{-1} s^{-1})	ζ/mV[(1)]
SNP12	1	42.920	-25.362	
15 ℃	2	42.887	-25.392	
	3	42.876	-25.427	
	4	42.842	-25.494	
	5[(2)]	42.887	-25.427	
	MW		-25.419	-62.42
	SD		0.0571	
	RSD		0.22%	
SNP12	1	48.334	-28.193	
20 ℃	2	48.263	-28.255	
	3	48.235	-28.294	
	4	48.292	-28.380	
	5[(2)]	48.278	-28.308	
	MW		-28.281	-61.53
	SD		0.0781	
	RSD		0.28%	
SNP12	1	54.398	-31.369	
25 ℃	2	54.273	-31.365	
	3	54.183	-31.349	
	4	54.077	-31.362	
	5[(2)]	54.237	-31.336	
	MW		-31.361	-61.92
	SD		0.00868	
	RSD		0.03%	
SNP22	1	43.304	-27.678	
15 ℃	2	43.213	-27.638	
	3	43.123	-27.641	
	4	43.077	-27.641	
	5[(2)]	43.179	-27.640	
	MW		-27.649	-60.57
	SD		0.0193	
	RSD		0.07%	
SNP22	1	48.995	-30.895	
20 ℃	2	48.894	-30.876	
	3	48.836	-30.863	
	4	48.778	-30.887	
	5[(2)]	48.879	-30.889	
	MW		-30.880	-60.24
	SD		0.0137	
	RSD		0.04%	
SNP22	1	54.452	-34.475	
25 ℃	2	54.506	-34.436	
	3	54.452	-34.380	
	4	54.416	-34.402	
	5[(2)]	54.434	-34.384	
	MW		-34.423	-61.14
	SD		0.0414	
	RSD		0.12%	

[(1)] modified Ohshima approximation, [(2)] from superimposed electropherograms

Table S5b. Determined electrophoretic mobilities and ζ potentials **(I = 60 mmol L^{-1})**, for experimental parameters refer to Figures 3 and S9.

NP	Run	μ_{eo}/(mm^2 kV^{-1} s^{-1})	μ_{ep}/(mm^2 kV^{-1} s^{-1})	ζ/mV[(1)]
SNP12	1	37.245	-24.096	
15 ℃	2	37.211	-24.176	
	3	37.144	-24.129	
	4	37.102	-24.160	
	5[(2)]	37.169	-24.114	
	MW		-24.140	-54.97
	SD		0.0353	
	RSD		0.15%	
SNP12	1	42.055	-27.185	
20 ℃	2	42.023	-27.197	
	3	42.023	-27.237	
	4	42.001	-27.330	
	5[(2)]	42.012	-27.217	
	MW		-27.247	-55.55
	SD		0.0657	
	RSD		0.24%	
SNP12	1	45.949	-30.102	
25 ℃	2	45.961	-30.100	
	3	45.974	-30.082	
	4	45.949	-30.082	
	5[(2)]	45.961	-30.095	
	MW		-30.091	-55.67
	SD		0.0109	
	RSD		0.04%	
SNP22	1	37.203	-26.331	
15 ℃	2	37.161	-26.362	
	3	37.144	-26.370	
	4	37.077	-26.394	
	5[(2)]	37.153	-26.359	
	MW		-26.364	-53.93
	SD		0.0261	
	RSD		0.10%	
SNP22	1	41.651	-29.648	
20 ℃	2	41.588	-29.613	
	3	41.598	-29.605	
	4	41.640	-29.668	
	5[(2)]	41.619	-29.650	
	MW		-29.634	-54.27
	SD		0.0297	
	RSD		0.10%	
SNP22	1	46.532	-33.168	
25 ℃	2	46.336	-33.005	
	3	46.480	-33.099	
	4	46.467	-33.085	
	5[(2)]	46.467	-33.094	
	MW		-33.089	-55.21
	SD		0.0668	
	RSD		0.20%	

[(1)] modified Ohshima approximation, [(2)] from superimposed electropherograms

Table S5c. Determined electrophoretic mobilities and ζ potentials **(I = 60 mmol L^{-1})**, for experimental parameters refer to Figures 3 and S9. **Reproducibility study.**

NP	Run	μ_{eo}/(mm^2 kV^{-1} s^{-1})	μ_{ep}/(mm^2 kV^{-1} s^{-1})	ζ/mV[(1)]
SNP12	1	37.380	-24.189	
15 ℃	2	37.423	-24.202	
	3	37.414	-24.265	
	4	37.397	-24.263	
	5[(2)]	37.397	-24.241	
	MW		-24.230	-55.27
	SD		0.0399	
	RSD		0.16%	
SNP12	1	42.023	-26.963	
20 ℃	2	41.959	-26.842	
	3	41.937	-26.888	
	4	41.927	-26.928	
	5[(2)]	41.959	-26.910	
	MW		-26.905	-54.59
	SD		0.0521	
	RSD		0.19%	
SNP12	1	46.797	-29.954	
25 ℃	2	46.717	-29.830	
	3	46.717	-29.899	
	4	46.691	-29.831	
	5[(2)]	46.744	-29.913	
	MW		-29.878	-55.31
	SD		0.0599	
	RSD		0.20%	
SNP22	1	37.144	-26.249	
15 ℃	2	37.111	-26.302	
	3	37.094	-26.282	
	4	37.052	-26.414	
	5[(2)]	37.111	-26.314	
	MW		-26.312	-53.79
	SD		0.0713	
	RSD		0.27%	
SNP22	1	41.746	-29.271	
20 ℃	2	41.693	-29.210	
	3	41.683	-29.210	
	4	41.725	-29.298	
	5[(2)]	41.714	-29.254	
	MW		-29.247	-53.36
	SD		0.0440	
	RSD		0.15%	
SNP22	1	46.467	-33.102	
25 ℃	2	46.730	-33.399	
	3	46.823	-33.443	
	4	--------[(3)]	--------[(3)]	
	5[(2)]	46.704	-33.064	
	MW		-33.315	-55.23
	SD		0.185	
	RSD		0.55%	

[(1)] modified Ohshima approximation, [(2)] from superimposed electropherograms, [(3)] not determined

Table S5d. Determined electrophoretic mobilities and ζ potentials **(I = 80 mmol L^{-1})**, for experimental parameters refer to Figures 3 and S9.

NP	Run	μ_{eo}/(mm^2 kV^{-1} s^{-1})	μ_{ep}/(mm^2 kV^{-1} s^{-1})	ζ/mV[(1)]
SNP12	1	33.067	-23.220	
15 ℃	2	32.941	-23.113	
	3	32.875	-23.185	
	4	32.869	-23.247	
	5[(2)]	32.895	-23.128	
	MW		-23.191	-50.43
	SD		0.0577	
	RSD		0.58%	
SNP12	1	38.018	-26.109	
20 ℃	2	37.931	-26.152	
	3	37.740	-26.026	
	4	37.593	-25.911	
	5[(2)]	37.852	-26.116	
	MW		-26.049	-50.70
	SD		0.106	
	RSD		0.41%	
SNP12	1	43.293	-29.246	
25 ℃	2	43.281	-29.211	
	3	43.304	-29.294	
	4	---------[(3)]	---------[(3)]	
	5[(2)]	43.293	-29.211	
	MW		-29.250	-51.77
	SD		0.0415	
	RSD		0.03%	
SNP22	1	34.072	-25.456	
15 ℃	2	---------[(3)]	---------[(3)]	
	3	---------[(3)]	---------[(3)]	
	4	---------[(3)]	---------[(3)]	
	5[(2)]	---------[(3)]	---------[(3)]	
	MW		-25.456	-50.12
	SD			
	RSD			
SNP22	1	38.761	-28.918	
20 ℃	2	38.679	-28.889	
	3	38.570	-28.806	
	4	---------[(3)]	---------[(3)]	
	5[(2)]	38.597	-28.676	
	MW		-28.871	-51.03
	SD		0.0580	
	RSD		0.20%	
SNP22	1	43.741	-32.082	
25 ℃	2	43.579	-32.035	
	3	43.533	-32.050	
	4	43.487	-32.111	
	5[(2)]	43.293	-31.902	
	MW		-32.069	-51.57
	SD		0.0339	
	RSD		0.11%	

[(1)] modified Ohshima approximation, [(2)] from superimposed electropherograms, [(3)] not determined

Table S5e. Determined electrophoretic mobilities and ζ potentials **(I = 80 mmol L^{-1})**, for experimental parameters refer to Figures 3 and S9. **Reproducibility study.**

NP	Run	μ_{eo}/(mm^2 kV^{-1} s^{-1})	μ_{ep}/(mm^2 kV^{-1} s^{-1})	ζ/mV[(1)]
SNP12	1	33.254	-23.189	
15 ℃	2	33.153	-23.177	
	3	33.127	-23.161	
	4	33.127	-23.268	
	5[(2)]	33.147	-23.162	
	MW		-23.200	-50.46
	SD		0.0475	
	RSD		0.20%	
SNP12	1	38.036	-25.983	
20 ℃	2	38.018	-25.935	
	3	37.975	-26.011	
	4	37.896	-25.957	
	5[(2)]	38.001	-25.964	
	MW		-25.971	-50.50
	SD		0.033	
	RSD		0.13%	
SNP12	1	42.887	-29.097	
25 ℃	2	42.865	-29.163	
	3	42.809	-29.168	
	4	42.809	-29.256	
	5[(2)]	42.842	-29.167	
	MW		-29.171	-51.89
	SD		0.0653	
	RSD		0.22%	
SNP22	1	33.682	-25.200	
15 ℃	2	33.552	-25.241	
	3	33.511	-25.237	
	4	33.497	-25.248	
	5[(2)]	33.599	-25.277	
	MW		-25.232	-49.58
	SD		0.0217	
	RSD		0.08%	
SNP22	1	38.815	-28.717	
20 ℃	2	38.697	-28.639	
	3	38.606	-28.682	
	4	38.525	-28.637	
	5[(2)]	38.597	-28.676	
	MW		-28.669	-50.59
	SD		0.0382	
	RSD		0.13%	
SNP22	1	43.338	-32.106	
25 ℃	2	43.270	-32.182	
	3	43.270	-32.156	
	4	43.247	-32.189	
	5[(2)]	43.281	-32.176	
	MW		-32.159	-51.75
	SD		0.0377	
	RSD		0.12%	

[(1)] modified Ohshima approximation, [(2)] from superimposed electropherograms

Table S5f. Determined electrophoretic mobilities and ζ potentials **(I = 100 mmol L^{-1})**, for experimental parameters refer to Figures 3 and S9.

NP	Run	μ_{eo}/(mm^2 kV^{-1} s^{-1})	μ_{ep}/(mm^2 kV^{-1} s^{-1})	ζ/mV[1]
SNP12	1	30.576	-22.291	
15 ℃	2	--------- [3]	---------[3]	
	3	---------[3]	---------[3]	
	4	---------[3]	---------[3]	
	5[2]	---------[3]	---------[3]	
	MW		-22.291	
	SD			
	RSD			
SNP12	1	34.623	-25.032	
20 ℃	2	34.623	-25.115	
	3	34.630	-25.193	
	4	34.674	-25.312	
	5[2]	34.630	-25.198	
	MW		-25.163	-47.44
	SD		0.119	
	RSD		0.47%	
SNP12	1	38.870	-27.976	
25 ℃	2	38.852	-28.075	
	3	38.834	-28.033	
	4	38.825	-28.006	
	5[2]	38.852	-28.032	
	MW		-28.022	-48.09
	SD		0.0419	
	RSD		0.15%	
SNP22	1	---------[3]	---------[3]	
15 ℃	2	30.689	-24.132	
	3	30.553	-24.025	
	4	30.525	-24.090	
	5[2]	30.587	-24.093	
	MW		-24.082	-45.99
	SD		0.0539	
	RSD		0.22%	
SNP22	1	34.718	-27.163	
20 ℃	2	34.660	-27.181	
	3	34.630	-27.170	
	4	34.645	-27.200	
	5[2]	34.652	-27.174	
	MW		-27.178	-46.57
	SD		0.0161	
	RSD		0.06%	
SNP22	1	38.624	-30.917	
25 ℃	2	38.552	-30.833	
	3	38.489	-30.701	
	4	38.534	-30.722	
	5[2]	38.561	-30.803	
	MW		-30.793	-48.07
	SD		0.101	
	RSD		0.33%	

[1] modified Ohshima approximation, [2] from superimposed electropherograms, [3] not determined

Table S5g. Determined electrophoretic mobilities and ζ potentials **(I = 120 mmol L^{-1})**, for experimental parameters refer to Figures 3 and S9.

NP	Run	μ_{eo}/(mm^2 kV^{-1} s^{-1})	μ_{ep}/(mm^2 kV^{-1} s^{-1})	ζ/mV[1]
SNP12	1	---------[3]	---------[3]	
15 ℃	2	---------[3]	---------[3]	
	3	---------[3]	---------[3]	
	4	---------[3]	---------[3]	
	5[2]	---------[3]	---------[3]	
	MW			
	SD			
	RSD			
SNP12	1	---------[3]	---------[3]	
20 ℃	2	---------[3]	---------[3]	
	3	---------[3]	---------[3]	
	4	---------[3]	---------[3]	
	5[2]	---------[3]	---------[3]	
	MW			
	SD			
	RSD			
SNP12	1	35.611	-26.783	
25 ℃	2	35.580	-26.829	
	3	35.595	-26.924	
	4	35.588	-27.228	
	5[2]	35.595	-26.895	
	MW		-26.941	-46.06
	SD		0.200	
	RSD		0.74%	
SNP22	1	---------[3]	---------[3]	
15 ℃	2	---------[3]	---------[3]	
	3	---------[3]	---------[3]	
	4	---------[3]	---------[3]	
	5[2]	---------[3]	---------[3]	
	MW			
	SD			
	RSD			
SNP22	1	32.467	-26.014	
20 ℃	2	32.391	-25.992	
	3	32.346	-25.983	
	4	32.416	-26.055	
	5[2]	32.384	-25.986	
	MW		-26.011	-43.66
	SD		0.0324	
	RSD		0.12%	
SNP22	1	35.758	-29.516	
25 ℃	2	35.619	-29.363	
	3	35.673	-29.372	
	4	35.688	-29.340	
	5[2]	35.673	-29.380	
	MW		-29.398	-45.02
	SD		0.0800	
	RSD		0.27%	

[1] modified Ohshima approximation, [2] from superimposed electropherograms, [3] not determined

Table S5h. Determined electrophoretic mobilities and ζ potentials **(I = 80 mmol L^{-1})**, for experimental parameters refer to Figures 3 and S10.

NP	Run	μ_{eo}/(mm^2 kV^{-1} s^{-1})	μ_{ep}/(mm^2 kV^{-1} s^{-1})	ζ/mV[(1)]
SNP7	1	33.307	-20.893	
15 ℃	2	33.287	-20.612	
1st ser.	3	33.207	-20.859	
	4	33.287	-20.935	
	5[(2)]	33.274	-20.982	
	MW		-20.825	-46.92
	SD		0.145	
	RSD		0.70%	
SNP7	1	38.203	-23.432	
20 ℃	2	38.115	-23.436	
1st ser.	3	38.045	-23.472	
	4	38.001	-23.408	
	5[(2)]	38.089	-23.436	
	MW		-23.437	-47.31
	SD		0.0266	
	RSD		0.11%	
SNP7	1	42.227	-26.260	
25 ℃	2	42.369	-26.329	
1st ser.	3	42.401	-26.230	
	4	42.314	-26.222	
	5[(2)]	42.325	-26.259	
	MW		-26.260	-48.30
	SD		0.0489	
	RSD		0.19%	
SNP7	1	33.538	-20.848	
15 ℃	2	33.477	-20.877	
2nd ser.	3	33.483	-20.970	
	4	---------[(3)]	---------[(3)]	
	5[(2)]	33.483	-20.885	
	MW		-20.899	-47.14
	SD		0.0637	
	RSD		0.30	
SNP7	1	38.150	-23.512	
20 ℃	2	38.089	-23.464	
2nd ser.	3	38.027	-23.553	
	4	38.071	-23.519	
	5[(2)]	38.080	-23.527	
	MW		-23.512	-47.50
	SD		0.0366	
	RSD		0.16%	
SNP7	1	42.865	-26.278	
25 ℃	2	42.820	-26.257	
2nd ser.	3	42.798	-26.179	
	4	---------[(3)]	---------[(3)]	
	5[(2)]	42.842	-26.294	
	MW		-26.238	-48.34
	SD		0.0519	
	RSD		0.20%	

[(1)] modified Ohshima approximation, [(2)] from superimposed electropherograms, [(3)] not determined

Table S5i. Determined electrophoretic mobilities and ζ potentials **(T = 25 °C)**, for experimental parameters refer to Figures 3 and S10.

NP	Run	μ_{eo}/(mm^2 kV^{-1} s^{-1})	μ_{ep}/(mm^2 kV^{-1} s^{-1})	ζ/mV[1]
SNP7	1	53.393	-28.230	
I = 40	2	53.393	-28.360	
mmol L^{-1}	3	53.290	-28.145	
	4	53.203	-28.515	
	5[2]	53.341	-28.391	
	MW		-28.312	-56.19
	SD		0.161	
	RSD		0.60%	
SNP7	1	47,294	-27.468	
I = 60	2	47.226	-27.538	
mmol L^{-1}	3	47.375	-27.352	
	4	47.267	-27.383	
	5	47.158	-27.345	
	6	47.024	-27.434	
	7[2]	47.253	-27.377	
	MW		-27.417	-52.34
	SD		0.0833	
	RSD		0.30%	
SNP7	1	42.227	-26.260	
I = 80	2	42.369	-26.329	
mmol L^{-1}	3	42.401	-26.230	
1st ser.	4	42.314	-26.222	
	5[2]	42.325	-26.259	
	MW		-26.260	-48.30
	SD		0.0489	
	RSD		0.19%	
SNP7	1	42.865	-26.278	
I = 80	2	42.820	-26.257	
mmol L^{-1}	3	42.798	-26.179	
2nd ser.	4	---------[3]	---------[3]	
	5[2]	42.842	-26.294	
	MW		-26.238	-48.34
	SD		0.0519	
	RSD		0.20%	
SNP7	1	42.876	-26.481	
I = 80	2	42.764	-26.353	
mmol L^{-1}	3	42.709	-26.346	
3rd ser.	4	42.643	-26.425	
	5[2]	42.742	-26.352	
	MW		-26.401	-48.29
	SD		0.0638	
	RSD		0.24%	
SNP7	1	38.652	-25.221	
I = 100	2	38.624	-25.265	
mmol L^{-1}	3	38.579	-25.303	
	4	38.561	-25.335	
	5[2]	38.606	-25.298	
	MW		-25.281	-45.24
	SD		0.0493	
	RSD		0.20%	

[1] modified Ohshima approximation, [2] from superimposed electropherograms, [3] not determined

Table S6. Illustration of the iterative scheme employed for the determination of ζ via the modified analytic approximation (see Equation (2))

c(borax)/ (mmol L^{-1})	κa	$\mu_{measured}$/ (10^{-8} m^2 s^{-1} V^{-1})	$\mu_{calculated}$/ (10^{-8} m^2 s^{-1} V^{-1})	ζ/mV	T = 15 °C
40	5.31013	-2.08247	-2.0821	-46.91	
1st series			-2.0824	-46.92	
			-2.0827	-46.93	**SNP7**
40	5.31013	-2.0899	-2.0897	-47.13	
2nd series			-2.0900	-47.14	
			-2.0904	-47.15	
20	5.38725	-2.54185	-2.5416	-62.41	
			-2.5418	-62.42	
			-2.5421	-62.43	
30	6.59835	-2.4140	-2.4137	-54.96	
1st series			-2.4140	-54.97	
			-2.4143	-54.98	
30	6.59835	-2.42295	-2.4228	-55.26	
2nd series			-2.4231	-55.27	**SNP12**
			-2.4234	-55.28	
40	7.61888	-2.31912	-2.3186	-50.42	
1st series			-2.3190	-50.43	
			-2.3193	-50.44	
40	7.61888	-2.31985	-2.3197	-50.45	
2nd series			-2.3200	-50.46	
			-2.3204	-50.47	
20	9.95825	-2.76495	-2.7648	-60.56	
			-2.7651	-60.57	
			-2.7654	-60.58	
30	12.19695	-2.63643	-2.6359	-53.92	
1st series			-2.6363	-53.93	
			-2.6367	-53.94	
30	12.19695	-2.63118	-2.6307	-53.78	
2nd series			-2.6311	-53.79	
			-2.6314	-53.80	**SNP22**
40	14.08338	-2.5456	-2.5453	-50.11	
1st series			-2.5457	-50.12	
			- 2.5461	-50.13	
40	14.08338	-2.52315	-2.5229	-49.57	
2nd series			-2.5233	-49.58	
			--2.5237	-49.59	
50	15.74928	-2.40821	-2.4076	-45.98	
			-2.4081	-45.99	
			-2.4085	-46.00	

c(borax)/ (mmol L^{-1})	κa	$\mu_{measured}$/ (10^{-8} m^2 s^{-1} V^{-1})	$\mu_{calculated}$/ (10^{-8} m^2 s^{-1} V^{-1})	ζ/mV	T = 20 °C
40	5.33025	-2.3437	-2.3432	-47.30	
1st series			-2.3436	-47.31	
			-2.3440	-47.32	**SNP7**
40	5.33025	-2.3512	-2.3506	-47.49	
2nd series			-2.3510	-47.50	
			-2.3514	-47.51	
20	5.40787	-2.82806	-2.8278	-61.52	
			-2.8281	-61.53	
			-2.8284	-61.54	
30	6.62310	-2.72375	-2.7233	-55.54	
1st series			-2.7237	-55.55	
			-2.7240	-55.56	
30	6.62310	-2.69050	-2.6900	-54.58	
2nd series			-2.6904	-54.59	
			-2.6907	-54.60	
40	7.64775	-2.60492	-2.6046	-50.69	
1st series			-2.6050	-50.70	
			-2.6054	-50.71	
40	7.64775	-2.59715	-2.5967	-50.49	
2nd series			-2.5971	-50.50	
			-2.5975	-50.51	
50	8.55030	-2.51629	-2.5159	-47.43	
			-2.5163	-47.44	
			-2.5167	-47.45	**SNP12**
20	9.99638	-3.08800	-3.0876	-60.23	
			-3.0879	-60.24	
			-3.0883	-60.25	
30	12.2427	-2.96339	-2.9630	-54.26	
1st series			-2.9634	-54.27	
			-2.9638	-54.28	
30	12.2427	-2.92474	-2.9243	-53.35	
2nd series			-2.9248	-53.36	
			-2.9252	-53.37	
40	14.13675	-2.88712	-2.8867	-51.02	
1st series			-2.8872	-51.03	
			-2.8876	-51.04	
40	14.13675	-2.86680	-2.8664	-50.58	
2nd series			-2.8668	-50.59	
			-2.8673	-50.60	
50	15.80510	-2.71785	-2.7176	-46.56	
			-2.7181	-46.57	
			-2.7186	-46.58	
60	17.31332	-2.60110	-2.6006	-43.65	
			-2.6012	-43.66	
			-2.6017	-43.67	**SNP22**

T = 25 °C

c(borax)/ (mmol L^{-1})	κa	$\mu_{measured}$/ (10^{-8} m^2 s^{-1} V^{-1})	$\mu_{calculated}$/ (10^{-8} m^2 s^{-1} V^{-1})	ζ/mV	
20	3.78465	-2.8310	-2.8306	-56.18	
			-2.8310	-56.19	
			-2.8313	-56.20	
30	4.63507	-2.7420	-2.7416	-52.33	
			-2.7420	-52.34	
			-2.7424	-52.35	
40	5.3521	-2.6240	-2.6238	-48.29	
1st series			-2.6242	-48.30	
			-2.6246	-48.31	**SNP7**
40	5.3521	-2.6260	-2.6255	-48.33	
2nd series			-2.6259	-48.34	
			-2.6263	-48.35	
40	5.3521	-2.6238	-2.6233	-48.28	
3rd series			-2.6238	-48.29	
			-2.6242	-48.30	
50	5.98402	-2.5280	-2.5274	-45.23	
			-2.5279	-45.24	
			-2.5283	-45.25	
20	5.43015	-3.1360	-3.1358	-61.91	
			-3.1361	-61.92	
			-3.1364	-61.93	
30	6.65033	-3.0090	-3.0088	-55.66	
1st series			-3.0092	-55.67	
			-3.0096	-55.68	
30	6.65033	-2.9954	-2.9949	-55.30	
2nd series			-2.9953	-55.31	
			-2.9957	-55.32	
40	7.6791	-2.9170	-2.9168	-51.76	
1st series			-2.9172	-51.77	**SNP12**
			-2.9176	-51.78	
40	7.6791	-2.9250	-2.9219	-51.88	
2nd series			-2.9224	-51.89	
			-2.9228	-51.90	
50	8.58577	-2.8020	-2.8016	-48.08	
			-2.8021	-48.09	
			-2.8026	-48.10	
60	9.405	-2.6940	-2.6935	-45.05	
			-2.6940	-45.06	
			-2.6945	-45.07	

20	10.03755	-3.4420	-3.4418	-61.13	**SNP22**
			-3.4422	-61.14	
			-3.4426	-61.15	
30	12.29303	-3.3090	-3.3088	-55.20	
1st series			-3.3093	-55.21	
			-3.3098	-55.22	
30	12.29303	-3.31023	-3.3098	-55.22	
2nd series			-3.3102	-55.23	
			-3.3107	-55.24	
40	14.1947	-3.2159	-3.2155	-51.74	
1st series			-3.2160	-51.75	
			-3.2165	-51.76	
40	14.1947	-3.24082	-3.2403	-52.23	
2nd series			-3.2408	-52.24	
			-3.2413	-52.25	
40	14.1947	-3.2069	-3.2064	-51.56	
3rd series			-3.2069	-51.57	
			-3.2074	-51.58	
50	15.87068	-3.0793	-3.0784	-48.16	
			-3.0790	-48.17	
			-3.0795	-48.18	
60	17.385	-2.9397	-2.9391	-45.01	
			-2.9397	-45.02	
			-2.9403	-45.03	

Table S7. Calculated surface charge density σ_ζ at the shear plane for the interface fused silica/buffer at different temperatures (for experimental parameters refer to Figure S9).

c(borax)/ mmol L^{-1}	κ/nm^{-1}	λ_D/nm	ζ/mV	σ_ζ/C m^{-2}	capillary
					T = 15 ℃
20	0.653	1.531	-67.22	-0.0430	
30	0.800	1.250	-58.12	-0.0425	
40	0.924	1.082	-51.98	-0.0421	
50	1.033	0.968	-47.78	-0.0421	
60	1.131	0.884	n. d.	n. d.	
MW				-0.0424	
SD				0.000451	
RSD				1.06%	
					T = 20 ℃
20	0.655	1.527	-68.46	-0.0428	
30	0.803	1.245	-58.95	-0.0420	
40	0.927	1.079	-53.83	-0.0428	
50	1.036	0.965	-48.83	-0.0420	
60	1.135	0.881	-45.67	-0.0423	
MW				-0.0424	
SD				0.000385	
RSD				0.91%	
					T = 25 ℃
20	0.658	1.520	-69.79	-0.0426	
30	0.806	1.241	-59.64	-0.0413	
40	0.931	1.074	-55.40	-0.0431	
50	1.041	0.961	-49.70	-0.0417	
60	1.140	0.877	-45.77	-0.0411	
MW				-0.0420	
SD				0000831	
RSD				1.98%	

MW: arithmetic mean; SD: standard deviation; RSD: relative standard deviation

Table S8. Calculated parameters of regression lines (for ranges of κa refer to Figures S11a-z)

T/°C	SNP[a]	ζ/mV	R	SSE/ ($m^2 V^{-1} s^{-1}$)	y-Interc./ ($10^{-8} m^2 V^{-1} s^{-1}$)	SE/ ($10^{-8} m^2 V^{-1} s^{-1}$)	Slope/ ($10^{-8} m^2 V^{-1} s^{-1}$)	SE/ ($10^{-8} m^2 V^{-1} s^{-1}$)
15	**12(20)**	-62.42	0.9948	$3.29 \cdot 10^{-4}$	2.246	0.0172	0.05613	0.00331
15	**12(30)**	-54.97	0.9981	$1.27 \cdot 10^{-4}$	2.062	0.00603	0.05315	0.000954
15	**12(40)**	-50.43	0.9990	$1.28 \cdot 10^{-4}$	1.941	0.00695	0.04884	0.000955
20	**12(20)**	-61.53	0.9959	$3.23 \cdot 10^{-4}$	2.494	0.0171	0.06275	0.00328
20	**12(30)**	-55.55	0.9993	$1.51 \cdot 10^{-4}$	2.325	0.00657	0.05991	0.00104
20	**12(40)**	-50.70	0.9990	$1.71 \cdot 10^{-4}$	2.181	0.00804	0.05465	0.00110
20	**12(50)**	-47.44	0.9977	$2.94 \cdot 10^{-4}$	2.099	0.0119	0.04794	0.00145
25	**12(20)**	-61.92	0.9962	$3.77 \cdot 10^{-4}$	2.764	0.0184	0.06959	0.00355
25	**12(30)**	-55.67	0.9993	$1.67 \cdot 10^{-4}$	2.568	0.00691	0.06601	0.00109
25	**12(40)**	-51.77	0.9990	$2.07 \cdot 10^{-4}$	2.440	0.00886	0.06123	0.00122
25	**12(50)**	-48.09	0.9977	$3.65 \cdot 10^{-4}$	2.336	0.0133	0.05331	0.00162
25	**12(60)**	-45.06	0.9970	$3.56 \cdot 10^{-4}$	2.258	0.0148	0.04555	0.00160
15	**22(20)**	-60.57	0.9980	$2.89 \cdot 10^{-4}$	2.251	0.0147	0.05083	0.00144
15	**22(30)**	-53.93	0.9975	$1.92 \cdot 10^{-4}$	2.181	0.0142	0.03681	0.00117
15	**22(40)**	-50.12	0.9975	$1.09 \cdot 10^{-4}$	2.146	0.0125	0.02807	0.000883
15	**22(50)**	-45.99	0.9976	$7.16 \cdot 10^{-5}$	2.045	0.0108	0.02284	0.000715
20	**22(20)**	-60.24	0.9979	$3.66 \cdot 10^{-4}$	2.522	0.0165	0.05574	0.00162
20	**22(30)**	-54.27	0.9975	$2.39 \cdot 10^{-4}$	2.455	0.0159	0.04103	0.00131
20	**22(40)**	-51.03	0.9975	$1.40 \cdot 10^{-4}$	2.432	0.0141	0.03181	0.000999
20	**22(50)**	-46.57	0.9977	$7.20 \cdot 10^{-5}$	2.340	0.0116	0.02369	0.000717
20	**22(60)**	-43.66	0.9978	$4.94 \cdot 10^{-5}$	2.253	0.0102	0.01996	0.000594
25	**22(20)**	-61.14	0.9979	$4.52 \cdot 10^{-4}$	2.810	0.0183	0.06206	0.00180
25	**22(30)**	-55.21	0.9975	$3.01 \cdot 10^{-4}$	2.739	0.0178	0.04583	0.00147
25	**22(40)**	-51.75	0.9975	$1.73 \cdot 10^{-4}$	2.708	0.0157	0.03538	0.00111
25	**22(50)**	-48.17	0.9977	$9.44 \cdot 10^{-5}$	2.644	0.0132	0.02714	0.000821
25	**22(60)**	-45.02	0.9978	$6.42 \cdot 10^{-5}$	2.541	0.0116	0.02274	0.000677

[a] c(borax) in mmol L^{-1} in brackets,
R = correlation coefficient, SSE = sum of squared errors, SE = standard error