MILLENNIUM APPLICATION BRIEF

TOPIC: Capillary Ion Analysis of Anions and Organic Acids in Circuit Board Extracts

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Introduction:

Analysis of anions and organic acids in circuit board extracts was done using the chromate electrolyte and preprogrammed isomigration routine. Analysis for anions and organic acids present is important in evaluating the cleanliness of the board. Organic acids such as succinic and adipic are typically from the flux used in soldering. Analysis of these circuit board extracts was done in less than 4.5 minutes. Samples were 10% IPA/water extracts which were run as is. Figures 1 and 2 are of two different standards used for calibration. Duplicate injections of two standards was done with the line forced through zero. Correlation coefficients of 0.99x with being a value of 7 or better were achieved. Figures 3 and 4 are duplicate injections of the same sample showing the presence of two typical organic acids, succinic and adipic, found on the board from the flux. The next two figures, 5 and 6, are of another sample showing in addition to succinic and adipic acid the presence of glutaric acids which is also due to the particular flux used. As can be seen CIA can be used for the rapid analysis of anions and organic acids in circuit board extracts.

EXPERIMENTAL:

Anion Analysis

System:	Q4000E
Electrolyte:	Chromate/OFM
Capillary:	75um X 60cm
Injection:	Hydrostatic, 30 seconds
Run Voltage:	-20kV
Detection:	Indirect UV at 254nm
Data:	Millennium 2010 Chromatography Manager, Ver. 2.1 with CIA Option

FIGURES:

Figure 1: Electropherogram of Anion Standard #1
Figure 2: Electropherogram of Anion Standard #2
Figure 3: Electropherogram of Sample 215-injection 1
Figure 4: Electropherogram of Sample 215-injection 2
Figure 5: Electropherogram of Sample 235-injection 1
Figure 6: Electropherogram of Sample 235-injection 2

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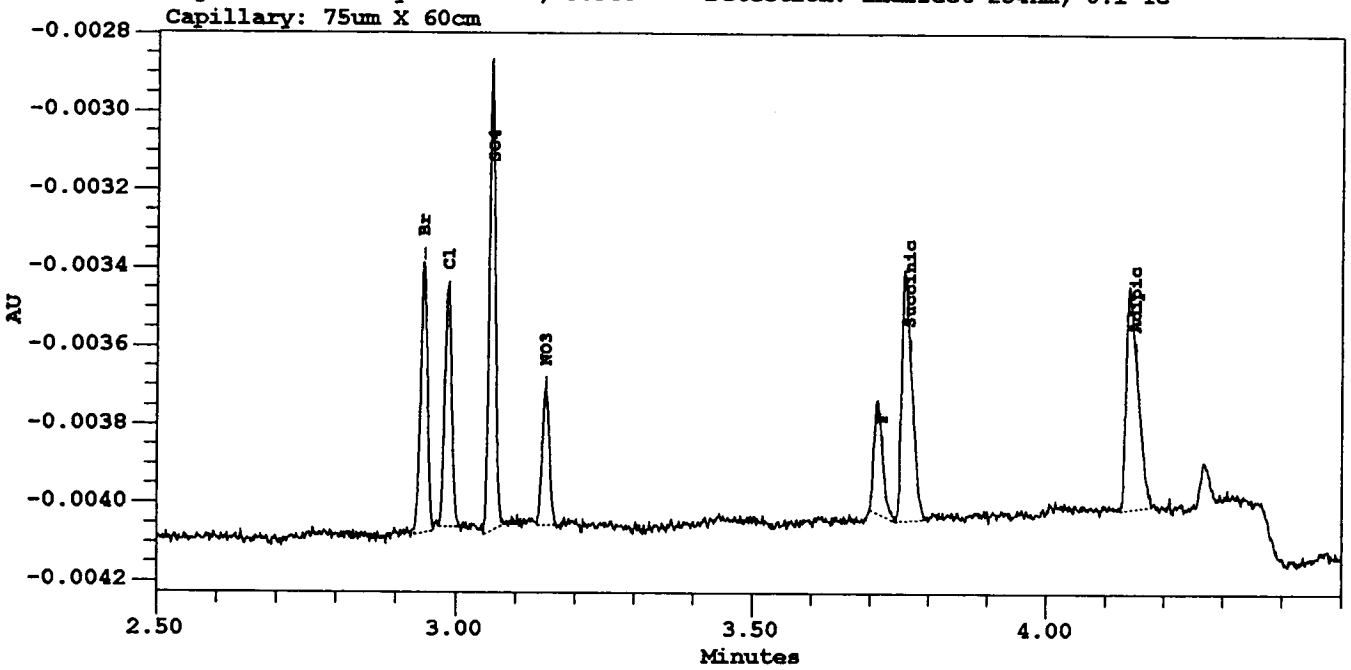
Sample Information

Project Name:			
SampleName:	Std 1		
Vial:	2	Sample Type:	Hydrostatic Standard
Injection:	2	Volume:	0.00
Channel:	SATIN	Run Time:	5.0 min
Date Acquired:	06/22/95 11:20:27 AM	Date Processed:	06/22/95 01:09:43 PM
Scale Factor:	1.00	Dilution:	1.00000
Acq Meth Set:	Anions_01		
Processing Method:	Anions_02		

SampleName: Std 1 Electrolyte: 4.5 mM Chromate/0.5 mM OFM RunVoltage: -20kV
InjectionMode: Hydrostatic, 30sec Detection: Indirect 254nm, 0.1 TC
Capillary: 75um X 60cm



Peak Results

#	Name	Migration Time (min)	Area (uV*sec)	Time Corr. Area	Height (uV)	Amount (ppm)
1	Br	2.947	549	186.31	690	2.000
2	Cl	2.989	499	166.88	620	1.000
3	SO4	3.063	848	276.70	1216	2.000
4	NO3	3.152	287	91.22	350	1.000
5	F	3.721	300	80.48	299	0.200
6	Succinic	3.768	782	207.48	648	2.000
7	Adipic	4.152	807	194.48	577	2.000

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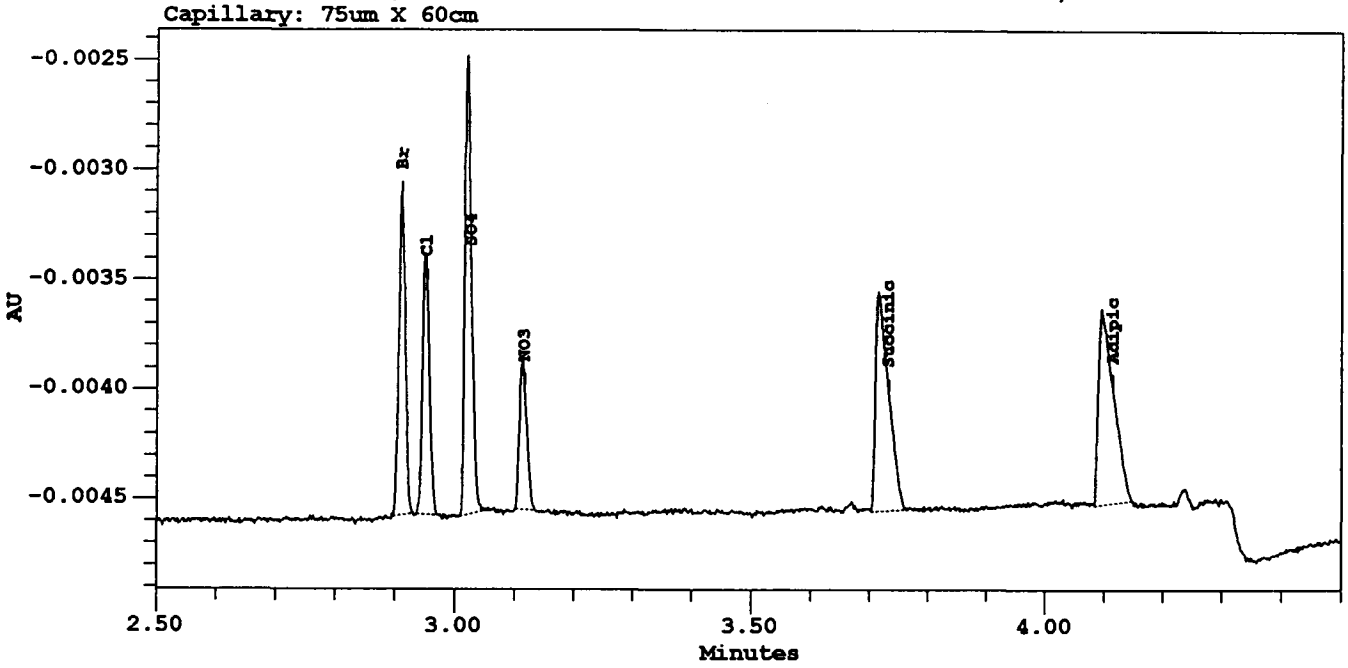
Sample Information

Project Name:			
SampleName:	Std 2		
Vial:	3	Sample Type:	Hydrostatic Standard
Injection:	2	Volume:	0.00
Channel:	SATIN	Run Time:	5.0 min
Date Acquired:	06/22/95 11:53:43 AM	Date Processed:	06/22/95 01:09:43 PM
Scale Factor:	1.00	Dilution:	1.00000
Acq Meth Set:	Anions_01		
Processing Method:	Anions_02		

SampleName: Std 2 Electrolyte: 4.5 mM Chromate/0.5 mM OFM RunVoltage: -20kV
InjectionMode: Hydrostatic, 30sec Detection: Indirect 254nm, 0.1 TC
Capillary: 75um X 60cm



Peak Results

#	Name	Migration Time (min)	Area (uV*sec)	Time Corr. Area	Height (uV)	Amount (ppm)
1	Br	2.912	1124	385.88	1478	4.000
2	Cl	2.954	954	322.82	1192	2.000
3	SO4	3.028	1610	531.72	2117	4.000
4	NO3	3.118	588	188.65	707	2.000
5	Succinic	3.733	1538	412.19	1003	4.000
6	Adipic	4.115	1603	389.55	901	4.000

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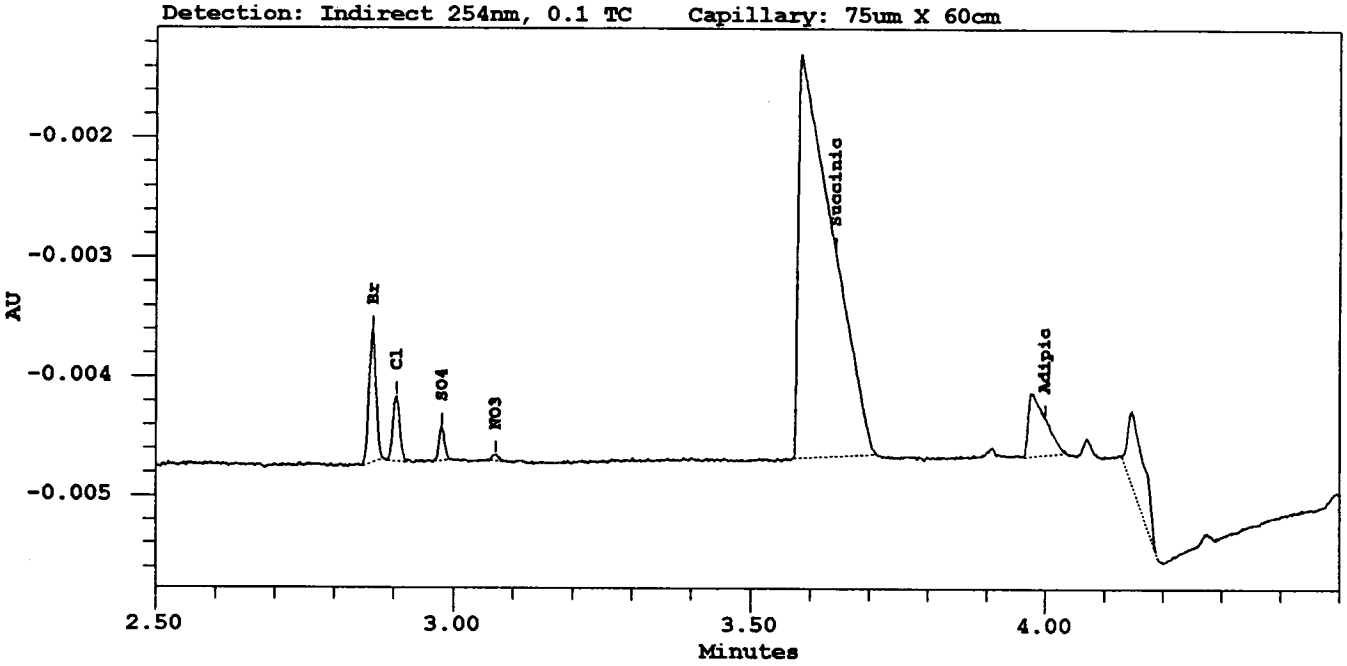
Sample Information

Project Name:			
SampleName:	Sample 215		
Vial:	4	Sample Type:	Hydrostatic Unknown
Injection:	1	Volume:	0.00
Channel:	SATIN	Run Time:	5.0 min
Date Acquired:	06/22/95 12:02:12 PM	Date Processed:	06/26/95 02:37:30 PM
Scale Factor:	1.00	Dilution:	1.00000
Acq Meth Set:	Anions_01		
Processing Method:	Anions_02		

SampleName: Sample 215 Electrolyte: 4.5 mM Chromate/0.5 mM OFM
RunVoltage: -20kV InjectionMode: Hydrostatic, 30sec
Detection: Indirect 254nm, 0.1 TC Capillary: 75um X 60cm



Peak Results

#	Name	Migration Time (min)	Area (uV*sec)	Time Corr. Area	Height (uV)	Amount (ppm)
1	Br	2.865	913	318.81	1113	3.311
2	Cl	2.905	439	151.29	550	0.937
3	SO4	2.981	191	64.07	293	0.482
4	NO3	3.071	36	11.80	56	0.126
5	Succinic	3.643	13346	3663.20	3377	35.422
6	Adipic	4.000	1091	272.84	529	2.784

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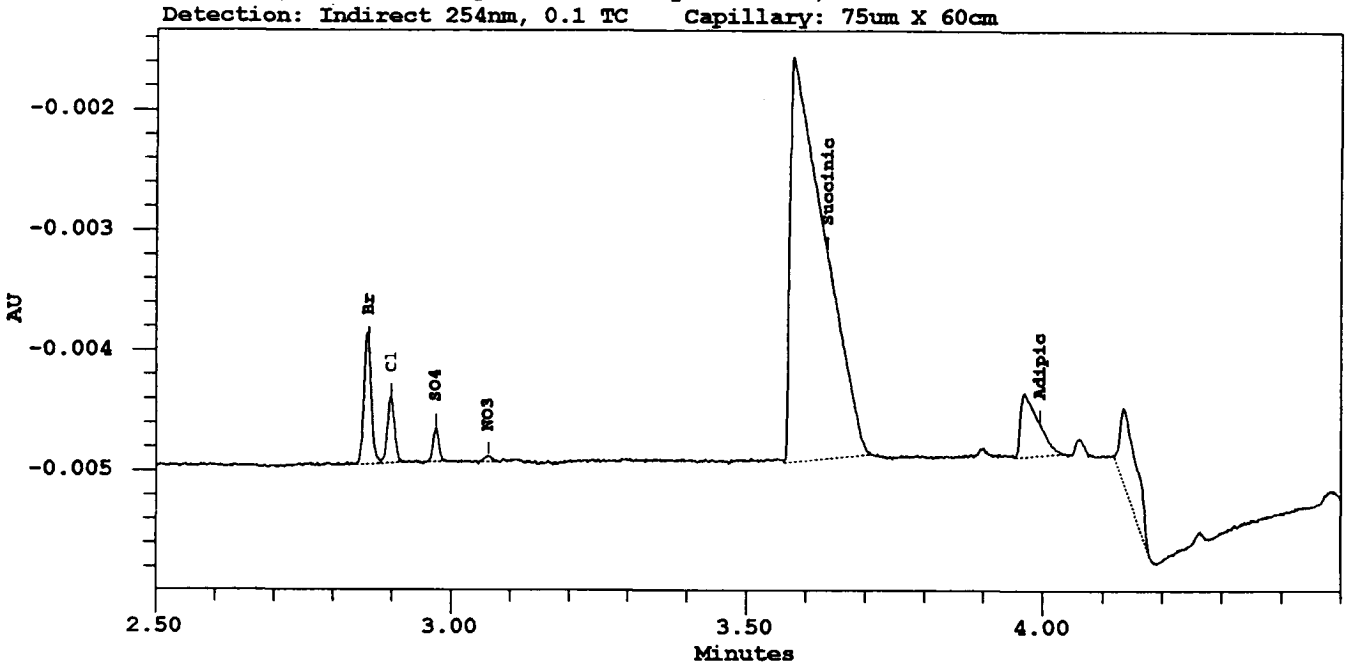
Sample Information

Project Name:			
SampleName:	Sample 215		
Vial:	4	Sample Type:	Hydrostatic Unknown
Injection:	2	Volume:	0.00
Channel:	SATIN	Run Time:	5.0 min
Date Acquired:	06/22/95 12:10:37 PM	Date Processed:	06/22/95 01:12:06 PM
Scale Factor:	1.00	Dilution:	1.00000
Acq Meth Set:	Anions_01		
Processing Method:	Anions_02		

SampleName: Sample 215 Electrolyte: 4.5 mM Chromate/0.5 mM OFM
RunVoltage: -20kV InjectionMode: Hydrostatic, 30sec
Detection: Indirect 254nm, 0.1 TC Capillary: 75um X 60cm



Peak Results

#	Name	Migration Time (min)	Area (uV*sec)	Time Corr. Area	Height (uV)	Amount (ppm)
1	Br	2.860	936	327.21	1095	3.398
2	Cl	2.899	465	160.48	550	0.994
3	SO4	2.974	190	63.81	282	0.480
4	NO3	3.063	36	11.84	53	0.126
5	Succinic	3.636	13281	3652.46	3363	35.318
6	Adipic	3.995	1092	273.26	529	2.788

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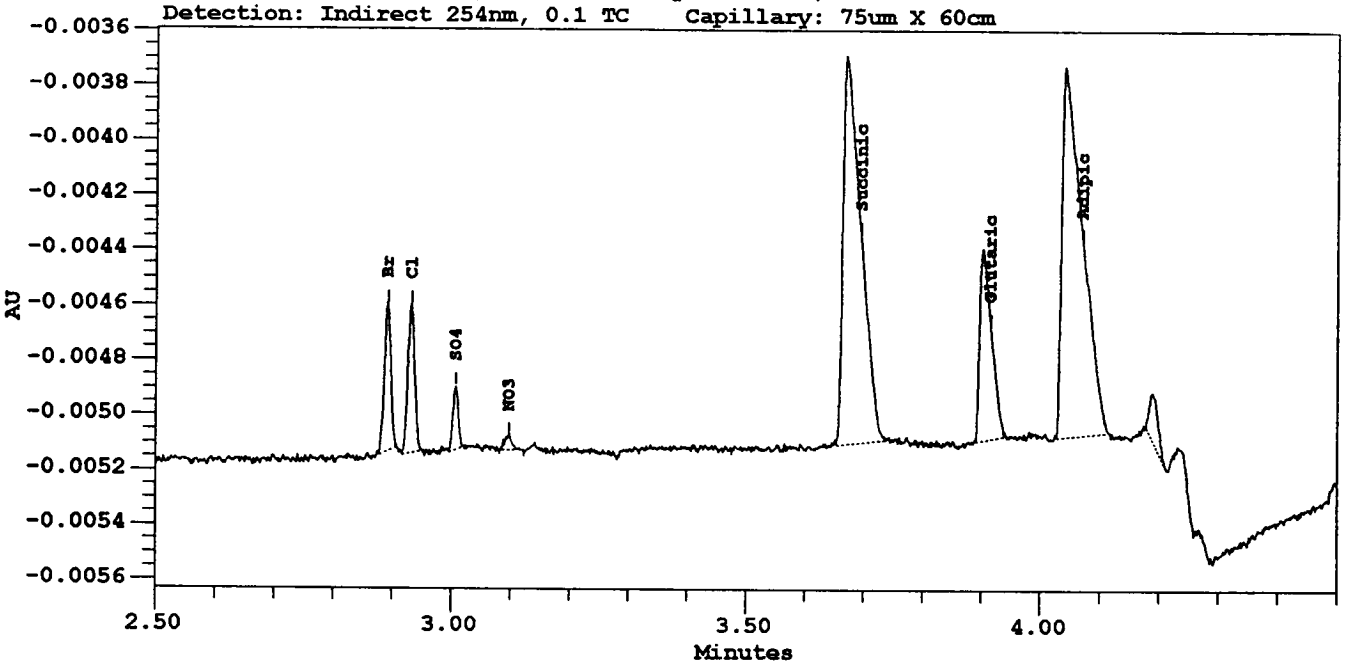
Sample Information

Project Name:			
SampleName:	Sample 235		
Vial:	5	Sample Type:	Hydrostatic Unknown
Injection:	1	Volume:	0.00
Channel:	SATIN	Run Time:	5.0 min
Date Acquired:	06/22/95 12:19:07 PM	Date Processed:	06/26/95 02:32:50 PM
Scale Factor:	1.00	Dilution:	1.00000
Acq Meth Set:	Anions_01		
Processing Method:	Anions_02		

SampleName: Sample 235 **Electrolyte:** 4.5 mM Chromate/0.5 mM OFM
RunVoltage: -20kV **InjectionMode:** Hydrostatic, 30sec
Detection: Indirect 254nm, 0.1 TC **Capillary:** 75um X 60cm



Peak Results

#	Name	Migration Time (min)	Area (uV*sec)	Time Corr. Area	Height (uV)	Amount (ppm)
1	Br	2.892	408	141.05	541	1.465
2	Cl	2.933	437	148.93	543	0.923
3	SO4	3.008	145	48.21	230	0.363
4	NO3	3.098	39	12.51	50	0.134
5	Succinic	3.696	2967	802.70	1416	7.762
6	Glutaric	3.916	973	248.48	710	2.497
7	Adipic	4.072	3253	798.92	1357	8.151

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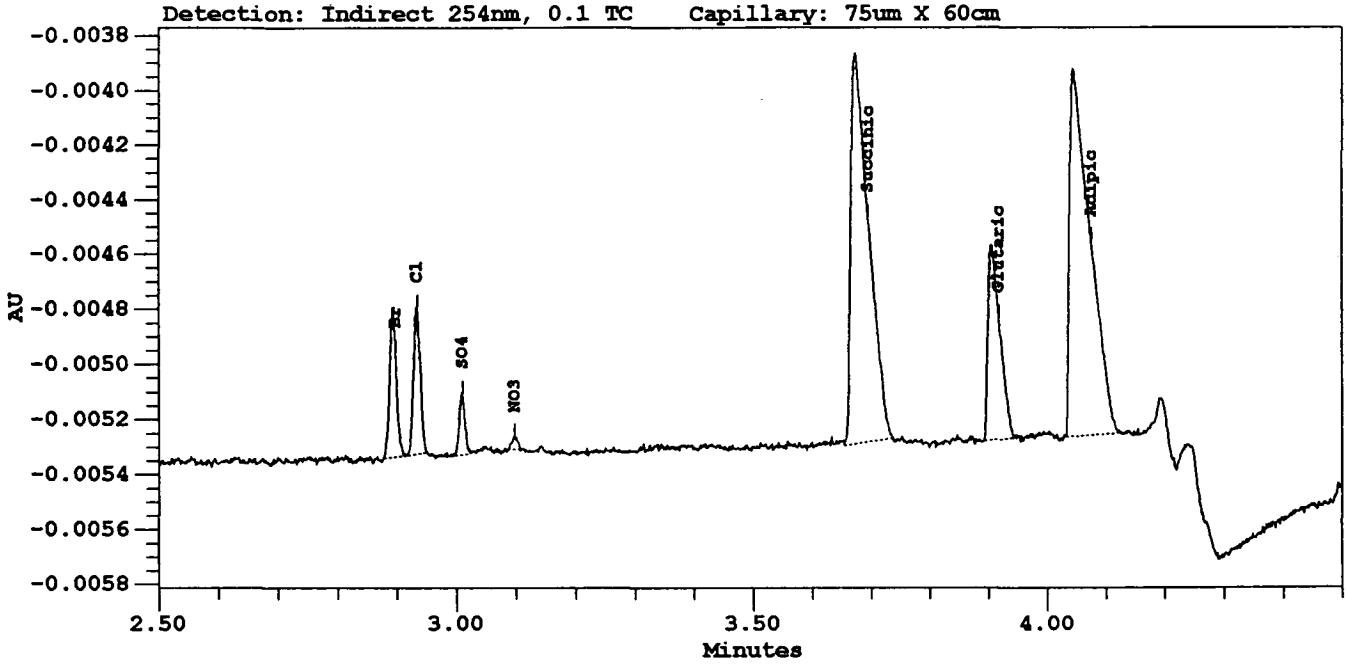
Sample Information

Project Name:			
SampleName:	Sample 235		
Vial:	5	Sample Type:	Hydrostatic Unknown
Injection:	2	Volume:	0.00
Channel:	SATIN	Run Time:	5.0 min
Date Acquired:	06/22/95 12:27:33 PM	Date Processed:	06/22/95 02:21:05 PM
Scale Factor:	1.00	Dilution:	1.00000
Acq Meth Set:	Anions_01		
Processing Method:	Anions_02		

SampleName: Sample 235 Electrolyte: 4.5 mM Chromate/0.5 mM OFM
RunVoltage: -20kV InjectionMode: Hydrostatic, 30sec
Detection: Indirect 254nm, 0.1 TC Capillary: 75um X 60cm



Peak Results

#	Name	Migration Time (min)	Area (uV*sec)	Time Corr. Area	Height (uV)	Amount (ppm)
1	Br	2.898	418	144.33	526	1.499
2	Cl	2.935	430	146.59	540	0.908
3	SO4	3.011	149	49.45	223	0.372
4	NO3	3.098	33	10.65	50	0.114
5	Succinic	3.696	2978	805.67	1424	7.791
6	Glutaric	3.918	992	253.26	713	2.545
7	Adipic	4.076	3261	800.06	1343	8.163