Supplemental Information for

Universal Microfluidic Automaton for Autonomous Sample Processing: Application to the Mars Organic Analyzer

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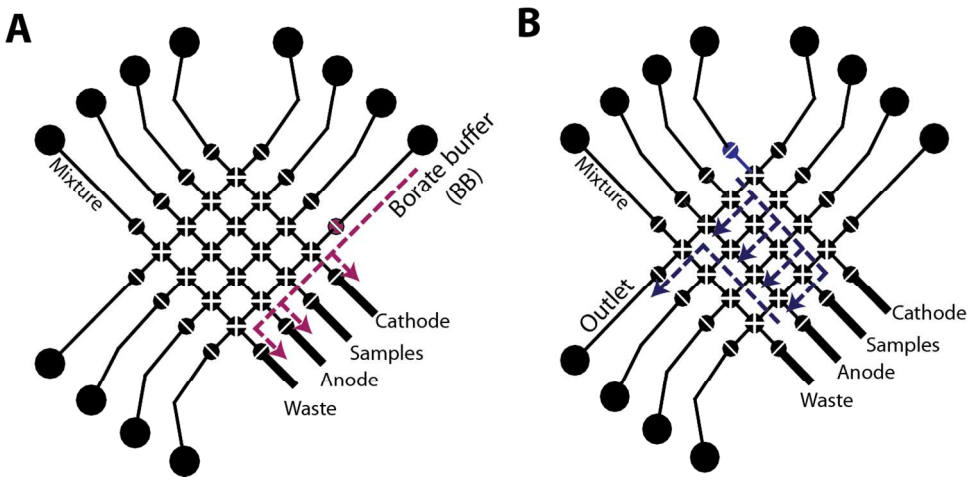

Figure SI1. Detail of (A) buffer loading process and (B) washing process.

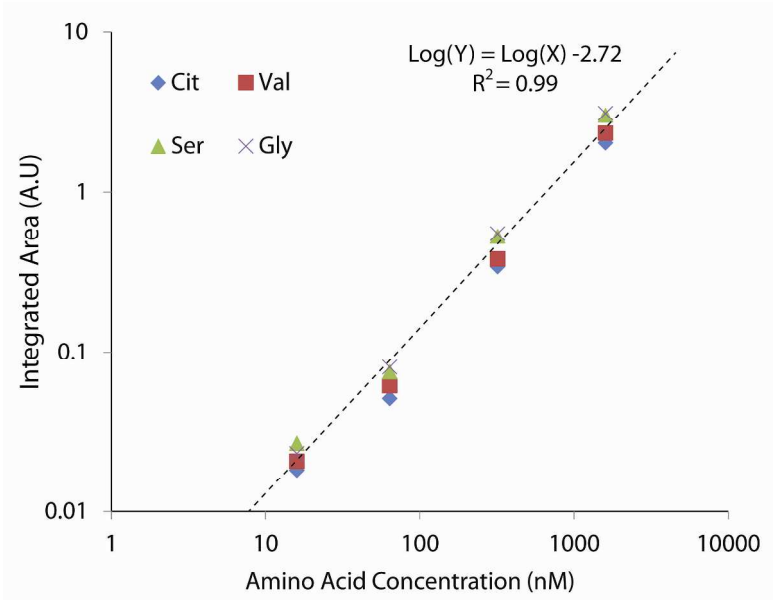

Figure SI2. Integrated peak area as a function of 4 different amino acid concentrations resulting from the automated sample processing program. There is a log-linear correlation between concentration and integrated area as expected.

Table SI1-1. Off-chip vs. on-chip labeling and separation of an amino acid standard.

	Labeling Efficiency (Peak Area, Rel. Fluorescence Units)		**Separation Efficiency** (Peak Efficiency, Theoretical Plates)	
	Off-Chip Manual	On-Chip Autonomous	Off-Chip Manual	On-Chip Autonomous
Cit	0.44	0.53	2.9×10^5	2.5×10^5
Val	0.46	0.57	2.8×10^5	2.4×10^5
Ser	0.55	0.74	2.7×10^5	2.2×10^5
Ala	0.21	0.28	2.7×10^5	2.2×10^5
Gly	0.70	0.95	2.4×10^5	2.2×10^5
Glu	0.41	0.61	1.8×10^5	1.5×10^5
Asp	0.23	0.31	1.8×10^5	1.7×10^5
Average	**0.43**	**0.57**	**2.5×10^5**	**2.1×10^5**
Normalized	**1.0**	**1.3**	**1.0**	**0.9**

Table SI1-2. Off-chip vs. on-chip labeling and separation of an aldehyde and ketone standard.

	Labeling Efficiency (Peak Area, Rel. Fluorescence Units)		**Separation Efficiency** (Peak Efficiency, Theoretical Plates)	
	Off-Chip Manual	On-Chip Autonomous	Off-Chip Manual	On-Chip Autonomous
Methylethyl ketone	0.25	0.17	3.5×10^5	3.6×10^5
Propionaldehyde	1.9	1.3	3.1×10^5	3.3×10^5
Acetaldehyde (1)	1.7	1.2	2.9×10^5	3.2×10^5
Acetaldehyde (2)	0.21	0.14	2.5×10^5	2.8×10^5
Formaldehyde	1.7	1.2	4.0×10^5	3.3×10^5
Average	**1.1**	**0.82**	**3.2×10^5**	**3.2×10^5**
Normalized	**1.0**	**0.8**	**1.0**	**1.0**

Table SI1-3. Off-chip vs. on-chip labeling and separation of a carboxylic acid standard.

	Labeling Efficiency (Peak Area, Rel. Fluorescence Units)		**Separation Efficiency** (Peak Efficiency, Theoretical Plates)	
	Off-Chip Manual	On-Chip Autonomous	Off-Chip Manual	On-Chip Autonomous
Valeric acid	0.28	0.33	0.6×10^5	0.5×10^5
Butanoic acid	0.32	0.42	1.0×10^5	0.8×10^5
Propionic acid	0.66	0.87	2.1×10^5	1.2×10^5
Acetic acid	0.37	0.54	1.0×10^5	0.8×10^5
Formic acid	0.63	1.0	0.9×10^5	0.8×10^5
Average	**0.45**	**0.64**	**1.1×10^5**	**0.8×10^5**
Normalized	**1.0**	**1.4**	**1.0**	**0.7**

Table SI02. Separation characteristics from figure 5E

Total Analysis					Amino Acid Analysis		Aldehyde / Ketone Analysis		Carboxylic Acid Analysis	
Species	***Conc.***	***Signal-to-Noise***	***N*[a]**	***Resolution*[b]**	***N*[a]**	***Resolution*[b]**	***N*[a]**	***Resolution*[b]**	***N*[a]**	***Resolution*[b]**
Cit	400 nM	1200	3.6×10^5		3.7×10^5					
Val	400 nM	1300	3.4×10^5	7.7	3.6×10^5	7.9				
Ser	400 nM	1200	3.2×10^5	6.0	3.3×10^5	6.1				
Gly	400 nM	1500	2.9×10^5	7.8	3.0×10^5	8.0				
Acetone	400 nM	4000	2.9×10^5	15			3.0×10^5			
PB (1)		900	2.8×10^5	0.66	2.6×10^5	16				
Acetic acid	400 nM	2800	1.3×10^5	3.3					1.3×10^5	
PB (2)		1200	2.8×10^5	0.96	3.2×10^5	5.4				
Formaldehyde	40 nM	4100	2.8×10^5	5.3			2.7×10^5	11		
CB		NA[c]	NA[c]	4.2			NA[c]	4.4[d]	NA[c]	9.6[d]
Formic acid	40 nM	4100	1.0×10^5	4.2[d]					1.1×10^5	5.2[d]

[a] Peak efficiency (theoretical plates).
[b] Resolution between the peak indicated and the previously eluting peak in the separation.
[c] Cannot be quantified in this electropherogram due to detector saturation.
[d] Estimated.