A colorimetric chemical tongue detects and distinguishes between multiple analytes

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SUPPLEMENTARY MATERIALS

Solutions for the '39-analyte study' (made in ddH_20)

Analyte	Manufacturer	Concentration (w/v or v/v)
Distilled Water	Nice!	NA
Sodium Chloride	Sigma	1%
Sodium Citrate	Sigma	1%
Sodium Carbonate	Sigma	1%
Ammonium Sulfate	Sigma	1%
Potassium Sorbate	Sigma	1%
HCl	Sigma	1%
NaOH	Sigma	1%
Tris Acetate EDTA (TAE)	Bioland Scientific	1X
Urea	Sigma	1%
Sucrose	Sigma	1%
Glucose	Sigma	1%
Galactitol	Sigma	1%
Sorbitol	Sigma	1%
PEG400	Sigma	1%
SDS	Sigma	1%
Triton X-100	Sigma	1%
Lysis Buffer	Applied Biosystems	1X
Glycine	Sigma	1%
Lysine	Sigma	1%
Cysteine	Sigma	1%
Collagen	Correxiko	1%
Glyphosate (Weed Killer)	Compare N Save	1%
Bovine Serum Albumin	Sigma	1%
Phenol	Sigma	1%
m-Cresol	Sigma	1%
Lysogeny Broth (LB)	Alfa Aesar	1X
Nutrient Broth (NB)	Alfa Aesar	1X
Vitamin C	Bulk Supplements	1%
Vitamin D	Bulk Supplements	1%
Green Tea Extract	Bulk Supplements	0.1%
Lambda Carrageenan	Modernist Pantry	0.1%
Kappa Carrageenan	Modernist Pantry	0.1%
Iota Carrageenan	Modernist Pantry	0.1%
Coffee	Nescafe	0.1%
Curry Powder	Badia	0.1%
Dawn Ultra Soap	Dawn	1%
Whole Milk	Darigold	10%
Urine	Human	40%

Working solutions for polymerization

The following working solutions were prepared

Monomer Solvent 1 (MS-1)

Acrylamide	38 mg
N,N'-methylenebisacrylamide	29 mg
Distilled Water	0.8 mL
DMSO	1.134 mL

Monomer Solvent 2 (MS-2)

Acrylamide	38 mg

N,N'-methylenebisacrylamide	29 mg
DMSO	1.934 mL

2M Acrylamide

Acrylamide	0.142 g
DMSO	108 uL
MS-1	750 uL

Monomer Stock Solutions (M1 to M14)

The hydrogel polymers were composed of between one and three monomers selected from the group of 14 monomers consisting of acrylamide, 2-carboxyethyl acrylate, acrylic acid, 2-cyanoethyl acrylate, N-[tris(hydroxymethyl)methyl] acrylamide, hydroxypropyl acrylate isomers, 4-hydroxybutyl acrylate, N-hydroxyethyl acrylamide, N,N-dimethylacrylamide, N-isopropylacrylamide, N-(1,1-dimethyl-3-oxobutyl) acrylamide, 2-methacryloxyethyl phenyl urethane, 1-acryloyloxy-3-(methacryloyloxy) 2-propanol and ethylene glycol phenyl ether acrylate. Monomer stock solutions M1 to M14 were formulated by dissolving the monomer first in DMSO and either MS-1 or MS-2, then adding additional acrylic acid or acrylamide as required to the final concentrations stated in the table below. MS-1 was used as the solvent for M1 to M14 and MS-2 was used only for M15.

No.	Monomer	Source	Monomer qty	DMSO (uL)	Mono-mer Solvent (uL)	Additional Acrylic Acid final conc. (M)	Additional Acrylamide final conc. (M)	Monomer final conc. (M)
M1	Acrylamide	Santa Cruz Biotech, #214492	142 mg	108	750			2
M2	2-Carboxyethyl acrylate	Polysciences, Inc., #16719	242 uL	8	750			2
M3	Acrylic Acid	Polysciences, Inc., #00020	144 uL	106	750			2
M4	Acrylic Acid + 0.5% NaOH	Polysciences, Inc., #00020	144 uL	81	750			2
M5	2-Cyanoethyl acrylate		182 uL		618		0.4	1.6
M6	N-[tris(hydroxymethyl)methy] acrylamide	Santa Cruz Biotech, #269682	175 mg				1	1
M7	Hydroxypropyl acrylate, isomers	Santa Cruz Biotech, #235342	250 uL		750			2
M8	4-hydroxybutyl acrylate	Polysciences, Inc., #25352	288.4 uL		712			2
M9	N-Hydroxyethyl acrylamide	Polysciences, Inc., #25109	208 uL	42	750			2
M11	N-iso-propylacrylamide	Polyscience, Inc., #02455	226 mg	24	750			2

M12	N-(1,1-Dimethyl-3-oxobutyl) acrylamide	Santa Cruz Biotech, #255312	255 mg		500		0.5	1.5
M13	2-methacryloxyethyl phenyl urethane	Polyscience, Inc., #25507	42.2 mg	57.8		1.8		0.2
M14	1-Acryloyloxy)-3(methacryloyloxy)2-propanol	Polysciences, Inc., #25351	28 uL	25	365	1	1	0.15
M15	Ethylene glycol phenyl ether acrylate	Santa Cruz Biotech, #239963	420 uL		580			2

A Trifunctional Monomer Stock Solution was also prepared with the following composition.

Tri-Functional Monomer (TFM) Stock Solution

Component	*Final Concentration*
Acrylic Acid	1M
Acrylamide	1M
Trimethylolpropane Triacrylate	0.03M
DMSO as solvent	

Photo-Initiator (PI) solution

PI solution (for DMPA)

DMPA (0.255 g/mL in DMSO)	100 uL
Glycerol	80 uL
Distilled Water	400 uL
DMSO	3.42 mL

Polymer library

A polymer library was combinatorially created from M1 to M15 with each polymer species falling into 3 categories; those with a predominantly single monomeric species (which we referred to as ‘A’ polymers), those comprising a combination of 3 monomeric species (which we referred to as ‘B’, ‘C’, ‘D’, ‘E’), and those comprising a combination of 2 monomeric species (which we referred to as ‘F’, ‘G’, ‘H’, ‘I’, ‘J’ and ‘K’ polymers). The following tables give the proportion by volume of each monomer stock solution for each polymer. Each column sums up to 10 (total volume).

		Polymers A1 to A14													
		A1	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**A9**	**A10**	**A11**	**A12**	**A13**	**A14**
Monomer Stock Solution (uL)	**M1**	10													
	M2		10												
	M3			10											
	M4				10										

	M5					10									
	M6						10								
	M7							10							
	M8								10						
	M9									10					
	M10										10				
	M11											10			
	M12												10		
	M13													10	
	M14														10

		Polymers B1 to B14													
		B1	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**B8**	**B9**	**B10**	**B11**	**B12**	**B13**	**B14**
Monomer Stock Solution (uL)	**M1**	7.5													
	M2		7.5												
	M3			7.5											
	M4				7.5										
	M5					7.5									
	M6						7.5								
	M7							7.5							
	M8								7.5						
	M9									7.5					
	M10										7.5				
	M11											7.5			
	M12												7.5		
	M13													7.5	
	M14														7.5
	TFM	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

		Polymers C1 to C14													
		C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**	**C10**	**C11**	**C12**	**C13**	**C14**
Monomer Stock Solution (uL)	**M1**	4			4		4								
	M2	4	4			4		4		4	4	4		4	

	M3		4							4					2
	M4			4	4				4		4				
	M5			4		4	4	4					4	4	2
	M6	2	2										4		
	M7			2		2									
	M8				2						2				
	M9						2		4						
	M10											4			
	M11							2	2	2					
	M12														
	M13														
	M14											2	2	2	6

		Polymers D1 to D14													
		D1	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**	**D8**	**D9**	**D10**	**D11**	**D12**	**D13**	**D14**
Monomer Stock Solution (uL)	**M1**														
	M2		2												
	M3								2						
	M4	2					2								
	M5			2		2						4			
	M6	4			4	6					4				2
	M7	4	4				6	4		4	2	4		4	
	M8		4	4	4				6	4			4		
	M9			4				4			4		4	4	2
	M10					2	2								
	M11							2	2	2					
	M12														
	M13				2										
	M14											2	2	2	6

	Polymers E1 to E14

		E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14
Monomer Stock Solution (uL)	**M1**														
	M2													2	
	M3														
	M4	2	2	2	2	2	2	2	2	2	2				
	M5						2								
	M6									4					
	M7														
	M8								4						
	M9												6		
	M10	4				2		6			4				
	M11	4	4		4		6				4	6		6	
	M12		4	4				2				2			2
	M13			4	4	6			4	4			2		2
	M14											2	2	2	6

SUPPLEMENTARY METHODS

Making combinatorial arrays

An equal volume of DMPA PI solution was added to each of monomer stock solutions A1 to A14, B1 to B14, C1 to C14, D1 to D14 and E1 to E14; and mixed well with a pipet. Arrays were created by spotting 1.3uL of each solution onto a silanized glass slide in the following configuration using a Biomek 2000 fluid handling robot. All slides used to create arrays were laser etched with a unique ID. Spots were photopolymerized under a 365nm Gel-Curing UV lamp (Jiadi, JD818) for 20 minutes.

A1	B1	C1	D1	E1
A2	B2	C2	D2	E2
A3	B3	C3	D3	E3
A4	B4	C4	D4	E4
A5	B5	C5	D5	E5
A6	B6	C6	D6	E6
A7	B7	C7	D7	E7
A8	B8	C8	D8	E8
A9	B9	C9	D9	E9
A10	B10	C10	D10	E10
A11	B11	C11	D11	E11
A12	B12	C12	D12	E12
A13	B13	C13	D13	E13
A14	B14	C14	D14	E14