

Computer-aided Design of Formulated Products: a Bridge Design of Experiments for Ingredient Selection

Liwei Cao,^{1,2,†} Danilo Russo,^{1,†} Emily Matthews^{3,†} Alexei Lapkin,^{1,2,} David Woods^{3,*}*

*¹ Department of Chemical Engineering and Biotechnology, University of Cambridge,
Cambridge CB3 0AS, UK*

*² Cambridge Centre for Advanced Research and Education in Singapore (CARES Ltd), #05-
05 CREATE Tower, 1 Create Way, Singapore 138602*

*³ Southampton Statistical Sciences Research Institute, Department of Mathematical Sciences,
University of Southampton, Southampton SO17 1BJ, UK*

Supplementary Materials

* Co-corresponding authors: A. Lapkin (Email: aal35@cam.ac.uk), D. Woods (Email: D.Woods@soton.ac.uk).

Table S1. Maximin DoE. Stability: 0 = Unstable; 1 = Stable.

S1-S5: surfactants; P1: polymer; T1: thickener

S1	S2	S3	S4	S5	P1	T1	Viscosity	Stability
(g/L)	(g/L)	(g/L)	(g/L)	(g/L)	(g/L)	(g/L)	(Pa·s)	
13.13	0.00	0.00	0.69	0.00	0.10	0.10	2.11E-03	1
0.00	12.36	1.54	0.00	0.00	0.10	0.23	2.22E-03	1
0.00	12.36	1.54	0.00	0.00	0.10	0.23	2.41E-03	1
10.13	0.00	3.95	0.00	0.00	0.11	0.11	2.54E-03	1
0.00	8.15	2.61	3.67	0.00	0.32	0.10	3.19E-03	0
0.00	14.89	0.01	0.00	0.00	0.10	1.74	3.51E-03	1
0.00	14.85	0.00	0.15	0.00	1.39	1.90	3.67E-03	1
13.06	0.07	0.00	0.88	0.00	1.98	1.02	3.84E-03	1
0.49	7.73	0.00	5.53	0.00	2.00	0.10	4.05E-03	1
0.00	0.00	1.62	12.21	0.12	0.27	0.18	4.37E-03	1
0.20	14.76	0.01	0.00	0.00	0.19	1.45	4.42E-03	1
0.00	0.00	11.49	2.38	0.00	0.10	0.10	4.61E-03	1
0.00	0.00	1.62	12.21	0.12	0.27	0.18	4.61E-03	1
2.59	11.41	0.02	0.00	0.00	2.00	2.00	4.81E-03	1
4.45	5.31	0.00	0.00	4.53	0.24	0.10	4.94E-03	1
0.00	0.00	11.49	2.38	0.00	0.10	0.10	5.17E-03	1
0.04	0.00	0.00	14.96	0.01	2.00	0.10	5.22E-03	1
0.00	0.20	6.15	0.00	8.49	1.83	0.10	5.23E-03	1
0.00	7.10	0.00	7.50	0.00	2.00	0.10	5.43E-03	1
0.00	10.00	0.00	0.00	4.90	2.00	2.10	5.50E-03	1
13.49	0.00	0.00	0.00	0.00	2.00	2.00	5.72E-03	1
0.00	0.09	0.00	0.69	12.77	1.96	1.39	5.74E-03	1
0.00	15.00	0.00	0.00	0.00	1.97	2.00	6.21E-03	1
0.00	0.00	0.00	0.00	15.00	1.37	0.10	6.22E-03	1
0.00	8.70	0.00	0.00	4.30	0.00	0.00	6.28E-03	1

0.00	6.43	0.97	0.00	5.94	1.37	0.34	6.83E-03	1
4.47	4.46	4.45	0.00	0.00	0.11	0.34	7.22E-03	1
9.24	2.54	0.00	1.40	0.00	1.88	1.29	7.49E-03	1
0.00	8.70	0.00	2.60	1.80	2.00	0.00	7.60E-03	1
0.00	0.00	14.86	0.14	0.00	0.16	0.45	7.97E-03	1
0.00	8.70	0.00	0.00	4.30	0.00	0.00	8.24E-03	1
0.00	8.70	0.00	0.00	4.30	2.00	0.00	8.27E-03	1
0.00	8.70	0.00	4.30	0.00	0.00	0.00	8.64E-03	1
0.00	4.70	4.70	0.00	4.70	1.74	0.16	8.91E-03	1
0.00	8.70	0.00	4.30	0.00	0.00	0.00	9.27E-03	1
0.00	0.00	4.77	3.84	4.39	0.10	1.39	9.61E-03	1
0.00	8.70	4.30	0.00	0.00	2.00	0.00	1.03E-02	0
0.00	8.70	0.00	0.00	4.30	2.00	0.00	1.03E-02	1
0.00	8.70	0.00	4.30	0.00	2.00	0.00	1.04E-02	0
0.00	8.70	2.60	0.00	1.70	2.00	0.00	1.05E-02	0
1.53	7.79	5.35	0.00	0.00	0.30	0.85	1.05E-02	1
0.00	8.70	0.00	4.30	0.00	2.00	0.00	1.06E-02	0
0.00	8.70	0.00	2.60	1.70	2.00	0.00	1.08E-02	0
0.00	0.00	15.00	0.00	0.00	2.00	0.10	1.11E-02	1
0.00	8.70	0.00	2.60	1.70	0.00	0.00	1.11E-02	1
0.00	8.70	4.30	0.00	0.00	0.00	0.00	1.12E-02	1
0.00	0.00	0.15	0.06	13.57	2.00	2.00	1.15E-02	1
0.00	8.70	0.00	2.60	1.70	0.00	0.00	1.17E-02	1
3.50	0.00	0.00	4.30	5.20	2.00	0.00	1.18E-02	1
0.00	8.70	4.30	0.00	0.00	2.00	0.00	1.20E-02	0
0.00	8.70	2.60	0.00	1.70	0.00	0.00	1.25E-02	1
0.00	8.70	4.30	0.00	0.00	0.00	0.00	1.27E-02	1
0.00	8.70	2.60	0.00	1.70	2.00	0.00	1.30E-02	0
0.00	3.68	6.06	5.24	0.00	0.10	0.48	1.34E-02	1
0.00	0.00	0.00	15.00	0.00	0.99	1.23	1.54E-02	0
0.00	5.00	5.00	5.00	0.00	2.00	0.45	1.55E-02	1

0.00	10.39	0.00	2.73	1.11	2.00	2.00	1.59E-02	1
5.30	0.00	0.00	2.60	5.10	2.00	0.00	1.62E-02	1
0.60	0.00	0.00	0.01	14.39	1.72	2.00	1.66E-02	0
3.50	0.00	0.00	4.30	5.20	2.00	0.00	1.82E-02	1
0.00	10.00	0.00	3.00	0.00	2.00	2.10	1.84E-02	0
0.00	10.00	0.00	3.00	0.00	0.00	2.10	1.88E-02	1
0.00	5.01	0.00	4.83	5.00	0.58	0.42	1.95E-02	0
0.00	10.00	0.00	3.00	0.00	2.00	2.10	1.98E-02	1
9.56	3.49	0.00	0.00	1.26	2.00	2.00	2.07E-02	0
5.20	0.00	2.60	0.00	5.20	2.00	0.00	2.22E-02	1
3.50	0.00	4.30	0.00	5.20	2.00	0.00	2.24E-02	1
0.00	10.10	3.00	0.00	0.00	2.00	2.10	2.41E-02	0
0.00	10.00	3.00	0.00	0.00	0.00	2.10	2.54E-02	1
0.00	0.67	0.00	0.00	14.05	1.50	2.00	2.59E-02	0
6.40	6.40	0.00	1.90	0.00	2.00	2.00	2.64E-02	1
0.00	10.00	3.00	0.00	0.00	2.00	2.10	2.64E-02	0
8.70	0.00	0.00	0.00	4.30	0.00	0.00	2.66E-02	1
8.70	0.00	0.00	0.00	4.30	2.00	0.00	2.81E-02	1
6.40	6.40	0.00	1.90	0.00	2.00	2.00	2.84E-02	0
0.00	5.30	0.00	2.60	5.10	2.00	0.00	2.97E-02	1
13.58	1.42	0.00	0.00	0.00	1.50	0.20	3.06E-02	0
0.00	3.50	0.00	4.30	5.20	2.00	0.00	3.10E-02	1
0.00	5.20	0.00	2.60	5.20	0.00	0.00	3.10E-02	1
8.70	0.00	0.00	0.00	4.30	0.00	0.00	3.10E-02	1
8.70	0.00	0.00	0.00	4.30	2.00	0.00	3.30E-02	1
0.00	5.20	2.60	0.00	5.20	2.00	0.00	3.82E-02	1
0.00	10.00	0.00	0.00	4.90	0.00	2.10	4.15E-02	1
0.00	6.36	0.07	6.57	0.00	1.96	1.37	4.19E-02	0
0.00	10.00	0.00	3.00	0.00	0.00	2.10	4.25E-02	1
0.00	10.00	0.00	3.00	0.00	0.00	2.10	4.29E-02	1
0.00	3.50	4.30	0.00	5.20	2.00	0.00	4.37E-02	1

0.00	5.20	2.60	0.00	5.20	0.00	0.00	4.47E-02	1
0.00	10.00	0.00	3.00	0.00	2.00	2.10	4.56E-02	0
0.00	10.00	0.00	3.00	0.00	2.00	2.10	4.57E-02	0
0.00	10.00	0.00	0.00	4.90	0.00	2.10	4.91E-02	1
0.00	10.00	0.00	4.90	0.00	0.00	2.10	4.95E-02	1
1.98	0.00	6.07	4.95	0.00	0.10	0.16	5.02E-02	0
5.20	0.00	0.00	4.30	3.50	2.00	0.00	5.05E-02	1
0.00	10.00	4.90	0.00	0.00	0.00	2.10	5.16E-02	1
0.00	10.00	0.00	4.90	0.00	2.00	2.10	5.20E-02	0
0.00	0.32	8.83	0.00	5.86	0.10	0.45	5.35E-02	0
0.00	10.00	0.00	4.90	0.00	2.00	2.10	5.37E-02	0
0.00	10.10	0.00	4.90	0.00	0.00	2.10	5.41E-02	1
2.40	0.00	10.00	1.89	0.00	1.99	0.47	5.42E-02	0
0.00	10.00	0.00	0.00	4.90	2.00	2.10	5.54E-02	0
0.00	0.00	5.70	7.76	0.00	1.85	1.17	5.60E-02	0
0.00	0.00	5.70	7.76	0.00	1.85	1.17	5.68E-02	0
0.00	5.20	0.00	4.30	3.50	0.00	0.00	5.77E-02	1
0.00	10.10	3.00	0.00	0.00	2.00	2.10	6.03E-02	0
0.00	10.00	3.00	0.00	0.00	2.00	2.10	6.50E-02	0
0.00	0.35	0.00	7.06	7.06	2.00	2.00	6.52E-02	1
0.00	10.00	0.00	3.00	2.00	0.00	2.10	6.60E-02	1
0.00	10.00	0.00	2.90	2.00	0.00	2.10	7.22E-02	1
0.00	10.00	0.00	2.90	2.00	2.00	2.10	7.36E-02	0
0.00	10.00	0.00	3.00	2.00	2.00	2.10	7.40E-02	0
0.00	9.55	2.69	0.00	2.10	2.00	2.00	7.73E-02	0
0.00	0.00	7.38	0.42	6.66	2.00	2.00	8.07E-02	1
0.00	0.35	0.00	7.06	7.06	2.00	2.00	8.14E-02	1
0.00	10.10	4.90	0.00	0.00	0.00	2.10	8.16E-02	1
0.00	10.00	4.90	0.00	0.00	2.00	2.10	8.42E-02	0
0.00	0.00	7.38	0.42	6.66	2.00	2.00	8.52E-02	1
0.00	10.00	4.90	0.00	0.00	2.00	2.10	8.91E-02	0

0.00	4.90	3.43	4.97	0.00	0.12	1.46	9.54E-02	0
0.00	0.00	0.00	15.00	0.00	0.10	1.95	1.01E-01	0
8.70	0.00	0.00	4.30	0.00	2.00	0.00	1.03E-01	0
0.00	10.00	3.00	0.00	2.00	0.00	2.10	1.06E-01	1
0.00	10.00	3.00	0.00	2.00	2.00	2.10	1.13E-01	0
0.00	10.00	2.90	0.00	2.00	0.00	2.10	1.15E-01	1
0.00	10.00	3.00	0.00	2.00	2.00	2.10	1.20E-01	0
5.20	0.00	4.30	0.00	3.50	2.00	0.00	1.32E-01	1
8.70	0.00	0.00	2.60	1.70	2.00	0.00	1.72E-01	0
4.91	6.09	0.00	3.53	0.00	1.87	1.84	1.77E-01	0
0.00	0.00	0.00	13.09	0.00	2.00	2.00	1.80E-01	0
8.70	0.00	0.00	2.60	1.70	0.00	0.00	1.82E-01	1
4.91	6.09	0.00	3.53	0.00	1.87	1.84	1.84E-01	0
5.89	3.37	5.73	0.00	0.00	0.10	1.98	1.86E-01	0
0.00	0.00	4.83	8.87	0.00	0.18	1.98	2.06E-01	1
8.70	0.00	0.00	2.60	1.70	2.00	0.00	2.06E-01	0
0.00	0.00	13.47	1.38	0.01	1.78	1.17	2.67E-01	0
0.00	6.77	6.23	0.00	0.00	1.96	1.81	2.94E-01	0
0.00	0.00	7.17	7.17	0.00	0.78	1.81	3.38E-01	0
8.70	0.00	4.30	0.00	0.00	0.00	0.00	3.44E-01	1
0.00	0.00	7.17	7.17	0.00	0.78	1.81	3.50E-01	0
6.89	4.15	2.91	0.00	0.00	2.00	1.59	3.53E-01	0
0.00	6.97	6.98	0.57	0.00	2.00	1.66	3.78E-01	0
8.70	0.00	2.60	0.00	1.70	0.00	0.00	3.83E-01	1
8.70	0.00	2.60	0.00	1.70	2.00	0.00	4.01E-01	0
0.00	0.45	0.00	13.34	0.00	2.00	2.00	4.05E-01	0
0.00	6.20	2.34	6.20	0.00	2.00	2.00	4.17E-01	0
0.00	0.86	6.85	6.85	0.00	2.00	2.00	4.30E-01	0
0.00	6.65	0.00	6.65	0.00	2.00	1.76	4.31E-01	0
0.00	6.65	0.00	6.65	0.00	2.00	1.76	4.42E-01	0
8.70	0.00	2.60	0.00	1.70	0.00	0.00	4.60E-01	1

8.70	0.00	4.30	0.00	0.00	0.00	0.00	4.63E-01	1
0.00	6.85	6.85	0.86	0.00	2.00	2.00	5.50E-01	0
0.00	5.05	4.34	4.55	0.00	2.00	2.00	5.90E-01	0
1.48	5.07	0.00	7.94	0.00	2.00	2.00	6.13E-01	0
0.00	0.00	5.00	5.00	5.00	2.00	2.00	6.24E-01	1
0.00	0.01	14.95	0.00	0.04	1.39	1.99	6.75E-01	0
0.00	0.00	12.70	1.17	0.00	2.00	2.00	7.29E-01	0
0.00	0.00	3.42	7.90	2.86	2.00	2.00	8.00E-01	1
0.00	0.46	12.34	0.20	0.00	1.48	2.00	8.58E-01	0
4.42	0.00	0.00	10.57	0.00	0.87	1.96	1.20E+00	0
0.00	0.00	0.00	11.45	1.99	0.10	1.99	1.53E+00	0
2.58	5.59	6.15	0.00	0.00	2.00	2.00	1.84E+00	0
1.77	0.00	0.00	8.78	2.89	0.16	2.00	2.01E+00	0
5.00	5.00	5.00	0.00	0.00	2.00	2.00	2.21E+00	0
4.10	0.00	0.00	4.90	6.00	2.00	2.10	2.27E+00	1
5.00	5.00	5.00	0.00	0.00	2.00	2.00	2.32E+00	0
5.11	0.00	2.78	0.00	5.11	0.10	1.27	2.74E+00	0
3.01	0.00	5.90	0.00	5.90	2.00	2.00	2.74E+00	1
3.01	0.00	5.90	0.00	5.90	2.00	2.00	2.76E+00	1
15.00	0.00	0.00	0.00	0.00	1.67	2.00	2.94E+00	0
0.00	5.28	0.00	5.28	4.37	2.00	2.00	2.97E+00	0
0.00	6.00	0.00	4.90	3.90	0.00	2.10	3.01E+00	1
0.00	5.28	0.00	5.28	4.37	2.00	2.00	3.04E+00	0
0.00	6.00	0.00	4.90	4.00	0.00	2.10	3.08E+00	1
5.19	0.00	2.94	5.94	0.00	2.00	2.00	3.15E+00	0
4.96	0.00	4.26	5.65	0.00	1.91	1.90	3.17E+00	0
0.00	4.45	0.00	5.03	5.03	0.19	2.00	3.18E+00	0
5.19	0.00	2.94	5.94	0.00	2.00	2.00	3.32E+00	0
8.62	2.95	0.00	1.73	0.00	1.83	1.91	3.35E+00	0
10.00	0.00	0.00	0.00	4.90	2.00	2.10	3.41E+00	0
6.83	0.34	0.00	7.28	0.00	0.65	1.89	3.45E+00	0

6.83	0.34	0.00	7.28	0.00	0.65	1.89	3.46E+00	0
5.76	3.56	4.81	0.00	0.00	2.00	2.00	3.65E+00	0
0.00	6.10	0.00	3.00	5.90	0.00	2.10	3.66E+00	1
5.43	0.51	0.00	0.00	8.42	2.00	2.00	3.71E+00	1
4.00	0.00	0.00	5.00	5.90	2.00	2.10	3.72E+00	1
5.26	0.00	4.41	5.26	0.00	2.00	2.00	3.85E+00	0
7.01	0.49	0.00	7.01	0.00	2.00	2.00	3.89E+00	0
5.26	0.00	4.41	5.26	0.00	2.00	2.00	3.90E+00	0
6.19	0.00	1.17	0.00	7.28	0.83	1.63	3.95E+00	0
7.01	0.49	0.00	7.01	0.00	2.00	2.00	3.96E+00	0
0.00	6.00	0.00	3.00	5.90	0.00	2.10	4.13E+00	1
0.00	3.26	5.79	0.00	5.79	2.00	2.00	4.31E+00	1
0.00	0.01	0.00	14.99	0.00	1.48	1.93	4.31E+00	0
1.58	0.00	7.30	0.00	4.96	2.00	2.00	4.36E+00	1
4.55	4.55	0.00	0.00	4.16	0.72	1.69	4.42E+00	0
10.00	0.00	0.00	0.00	4.90	0.00	2.10	4.59E+00	1
3.22	0.00	0.00	4.47	6.41	2.00	2.00	4.59E+00	1
0.00	7.12	0.00	0.22	7.12	2.00	2.00	4.62E+00	1
0.00	4.00	0.00	4.90	5.90	2.00	2.10	4.96E+00	0
1.68	5.85	0.00	0.00	6.35	2.00	2.00	5.12E+00	0
0.00	4.00	0.00	4.90	6.00	2.00	2.10	5.27E+00	0
3.95	5.47	0.00	0.00	5.47	2.00	2.00	5.56E+00	0
6.10	0.00	0.00	3.00	5.90	2.00	2.10	5.63E+00	0
3.95	5.47	0.00	0.00	5.47	2.00	2.00	5.69E+00	0
6.00	0.00	0.00	3.00	5.90	2.00	2.10	5.70E+00	0
10.10	0.00	0.00	2.90	2.00	0.00	2.10	5.71E+00	1
10.00	0.00	0.00	0.00	4.90	0.00	2.10	5.83E+00	1
5.72	2.56	6.44	0.00	0.00	2.00	1.94	6.04E+00	0
0.00	6.10	4.90	0.00	3.90	0.00	2.10	6.85E+00	1
4.00	0.00	4.90	0.00	5.90	2.00	2.10	6.92E+00	1
0.00	6.00	4.90	0.00	4.00	0.00	2.10	7.00E+00	1

0.00	6.00	3.00	0.00	5.90	0.00	2.10	7.82E+00	1
0.00	6.00	3.00	0.00	5.90	0.00	2.10	7.98E+00	1
9.48	0.00	2.28	0.00	2.58	2.00	2.00	8.40E+00	0
5.03	0.00	4.79	0.00	5.18	0.25	2.00	8.47E+00	0
4.10	0.00	4.90	0.00	6.00	2.00	2.10	8.74E+00	1
5.00	0.00	0.00	5.00	5.00	2.00	2.00	8.97E+00	0
6.03	0.00	7.15	0.00	0.02	1.58	2.00	9.22E+00	0
7.08	0.00	7.08	0.32	0.00	2.00	2.00	9.72E+00	0
7.08	0.00	7.08	0.32	0.00	2.00	2.00	9.87E+00	0
6.00	0.00	3.00	0.00	5.90	2.00	2.10	1.07E+01	0
0.00	4.02	4.50	0.00	4.47	2.00	2.00	1.09E+01	0
10.00	0.00	3.00	0.00	0.00	0.00	2.10	1.10E+01	1
6.10	0.00	3.00	0.00	5.90	2.00	2.10	1.12E+01	0
10.00	0.00	3.00	0.00	0.00	0.00	2.10	1.15E+01	1
5.00	0.00	0.00	5.00	5.00	2.00	2.00	1.26E+01	0
0.00	4.00	4.90	0.00	6.00	2.00	2.10	1.28E+01	0
10.00	0.00	0.00	3.00	2.00	0.00	2.10	2.19E+01	1
10.10	0.00	2.90	0.00	2.00	0.00	2.10	3.61E+01	1
10.00	0.00	2.90	0.00	2.00	0.00	2.10	3.99E+01	1

Table S2. Bridge-design DoE. Stability: 0 = Unstable; 1 = Stable.

S1-S5: surfactants; P1: polymer; T1: thickener

0.00	14.89	0.01	0.00	0.00	0.10	1.74	3.51E-03	1
0.00	14.85	0.00	0.15	0.00	1.39	1.90	3.67E-03	1
13.06	0.07	0.00	0.88	0.00	1.98	1.02	3.84E-03	1
0.20	14.76	0.01	0.00	0.00	0.19	1.45	4.42E-03	0
4.45	5.31	0.00	0.00	4.53	0.24	0.10	4.94E-03	1
0.04	0.00	0.00	14.96	0.01	2.00	0.10	5.22E-03	1
0.00	0.20	6.15	0.00	8.49	1.83	0.10	5.23E-03	1
0.00	7.10	0.00	7.50	0.00	2.00	0.10	5.43E-03	1
0.00	0.09	0.00	0.69	12.77	1.96	1.39	5.74E-03	1
0.00	15.00	0.00	0.00	0.00	1.97	2.00	6.21E-03	1
0.00	0.00	0.00	0.00	15.00	1.37	0.10	6.22E-03	1
0.00	6.43	0.97	0.00	5.94	1.37	0.34	6.83E-03	1
4.47	4.46	4.45	0.00	0.00	0.11	0.34	7.22E-03	1
9.24	2.54	0.00	1.40	0.00	1.88	1.29	7.49E-03	1
0.00	0.00	14.86	0.14	0.00	0.16	0.45	7.97E-03	1
0.00	4.70	4.70	0.00	4.70	1.74	0.16	8.91E-03	1
0.00	0.00	4.77	3.84	4.39	0.10	1.39	9.61E-03	1
1.53	7.79	5.35	0.00	0.00	0.30	0.85	1.05E-02	1
0.00	0.00	15.00	0.00	0.00	2.00	0.10	1.11E-02	1
0.00	3.68	6.06	5.24	0.00	0.10	0.48	1.34E-02	1
0.00	0.00	0.00	15.00	0.00	0.99	1.23	1.54E-02	1
0.60	0.00	0.00	0.01	14.39	1.72	2.00	1.66E-02	1
0.00	5.01	0.00	4.83	5.00	0.58	0.42	1.95E-02	1
0.00	0.67	0.00	0.00	14.05	1.50	2.00	2.59E-02	0
13.58	1.42	0.00	0.00	0.00	1.50	0.20	3.06E-02	1
0.00	6.36	0.07	6.57	0.00	1.96	1.37	4.19E-02	1
1.98	0.00	6.07	4.95	0.00	0.10	0.16	5.02E-02	1
0.00	0.32	8.83	0.00	5.86	0.10	0.45	5.35E-02	1
0.00	4.90	3.43	4.97	0.00	0.12	1.46	9.54E-02	1

0.00	0.00	0.00	15.00	0.00	0.10	1.95	1.01E-01	1
5.89	3.37	5.73	0.00	0.00	0.10	1.98	1.86E-01	1
0.00	0.00	13.47	1.38	0.01	1.78	1.17	2.67E-01	1
0.00	6.77	6.23	0.00	0.00	1.96	1.81	2.94E-01	1
0.00	0.01	14.95	0.00	0.04	1.39	1.99	6.75E-01	1
0.00	0.46	12.34	0.20	0.00	1.48	2.00	8.58E-01	1
4.42	0.00	0.00	10.57	0.00	0.87	1.96	1.20E+00	1
0.00	0.00	0.00	11.45	1.99	0.10	1.99	1.53E+00	0
1.77	0.00	0.00	8.78	2.89	0.16	2.00	2.01E+00	1
5.11	0.00	2.78	0.00	5.11	0.10	1.27	2.74E+00	1
15.00	0.00	0.00	0.00	0.00	1.67	2.00	2.94E+00	1
0.00	4.45	0.00	5.03	5.03	0.19	2.00	3.18E+00	1
8.62	2.95	0.00	1.73	0.00	1.83	1.91	3.35E+00	1
6.19	0.00	1.17	0.00	7.28	0.83	1.63	3.95E+00	1
0.00	0.01	0.00	14.99	0.00	1.48	1.93	4.31E+00	1
4.55	4.55	0.00	0.00	4.16	0.72	1.69	4.42E+00	1
5.03	0.00	4.79	0.00	5.18	0.25	2.00	8.47E+00	1
6.03	0.00	7.15	0.00	0.02	1.58	2.00	9.22E+00	1
0.00	4.02	4.50	0.00	4.47	2.00	2.00	1.09E+01	0

Table S3. Iterative verification. Stability: 0 = Unstable; 1 = Stable.

S1-S5: surfactants; P1: polymer; T1: thickener

S1	S2	S3	S4	S5	P1	T1	Viscosity	Stability	Iteration
(g/L)	(g/L)	(g/L)	(g/L)	(g/L)	(g/L)	(g/L)	(Pa·s)		
3.34	0.00	0.00	3.34	6.66	2.00	1.30	6.00E+00	1	1
3.34	3.34	0.00	0.00	6.66	2.00	1.30	1.52E+01	1	1
3.34	5.00	0.00	0.00	6.66	0.70	1.30	7.88E+00	1	1
10.00	0.00	0.00	1.66	3.34	1.80	0.70	5.00E-03	1	1
3.34	0.00	5.00	0.00	6.66	1.80	1.80	2.17E+01	1	1
1.66	0.00	8.34	0.00	5.00	2.00	1.30	3.60E+00	1	1
1.66	0.00	0.00	6.66	6.66	1.80	1.60	2.52E+00	1	1
1.66	6.66	0.00	0.00	6.66	2.00	1.60	4.09E+00	1	1
5.00	0.00	0.00	5.00	5.00	2.00	0.90	2.38E+00	1	1
3.34	0.00	5.00	0.00	6.66	1.80	2.00	2.21E+01	1	1
3.34	0.00	3.34	0.00	6.66	1.80	1.30	7.22E+00	1	1
10.00	0.00	3.34	1.66	0.00	1.80	0.90	2.60E-02	1	1
10.00	1.66	3.34	0.00	0.00	1.80	0.90	9.00E-03	1	1
15.00	0.00	0.00	0.00	0.00	0.90	2.00	6.00E-03	1	1
10.00	0.00	1.66	0.00	3.34	0.70	2.00	1.22E+01	1	1
10.00	0.00	0.00	0.00	5.00	2.00	1.60	7.36E+00	1	1
6.66	0.00	8.34	0.00	0.00	1.10	2.00	8.79E+00	1	1
6.66	0.00	1.66	0.00	6.66	2.00	2.00	3.46E+01	1	1
10.00	0.00	1.66	3.34	0.00	1.60	0.90	1.40E-02	1	1
3.34	0.00	0.00	5.00	6.66	0.20	1.60	9.13E+00	1	1
2.14	0.00	0.00	5.36	6.43	1.71	2.00	7.59E+00	1	2
6.43	2.14	5.36	0.00	0.00	1.29	0.86	2.22E-01	1	2
5.36	3.21	0.00	0.00	5.36	0.29	1.86	1.83E+01	1	2
5.36	0.00	6.43	3.21	0.00	1.29	1.71	2.86E+00	1	2
5.36	0.00	3.21	0.00	5.36	0.86	1.86	1.90E+01	1	2

5.36	0.00	6.43	0.00	3.21	1.43	2.00	1.87E+01	1	2
5.36	6.43	0.00	0.00	3.21	1.43	2.00	8.00E-01	1	2
0.00	8.57	0.00	2.14	3.21	0.43	1.86	6.80E-02	1	2
6.43	4.29	3.21	0.00	0.00	1.29	1.86	3.99E-01	1	2
4.29	0.00	0.00	2.14	8.57	0.71	1.71	2.16E+01	1	2
10.71	0.00	0.00	2.14	1.07	1.14	1.43	2.40E-02	1	2
6.43	0.00	8.57	0.00	0.00	1.29	1.86	6.06E+00	1	2
6.43	0.00	0.00	4.29	3.21	1.71	1.57	7.50E+00	1	2
2.14	0.00	6.43	0.00	6.43	0.86	1.29	6.86E+00	1	2
2.14	7.50	0.00	0.00	5.36	1.43	1.86	1.77E+00	1	2
0.00	10.71	0.00	0.00	4.29	0.29	1.57	1.50E-02	1	2
4.29	2.14	0.00	0.00	8.57	0.71	1.57	2.88E+01	1	2
7.50	7.50	0.00	0.00	0.00	1.86	0.86	4.00E-03	1	2
0.00	5.36	4.29	0.00	4.29	0.29	1.57	2.75E+00	1	2
9.64	3.21	0.00	2.14	0.00	0.00	0.71	4.00E-03	1	2
0.00	0.00	0.00	9.64	5.36	1.86	1.86	4.80E-01	1	3
5.36	7.50	0.00	0.00	2.14	1.14	2.00	3.10E-02	1	3
0.00	3.21	0.00	6.43	5.36	1.43	1.86	3.36E+00	1	3
9.64	0.00	2.14	0.00	2.14	0.71	0.71	1.50E-02	1	3
3.21	0.00	0.00	4.29	6.43	2.00	0.43	2.90E-02	1	3
3.21	0.00	4.29	0.00	6.43	1.86	0.29	5.00E-02	1	3
7.50	5.36	1.07	0.00	0.00	0.00	1.71	1.00E-02	1	3
4.29	0.00	0.00	6.43	3.21	1.43	2.00	7.74E+00	1	3
2.14	6.43	0.00	0.00	5.36	0.00	1.86	3.13E+00	1	3
0.00	6.43	0.00	3.21	5.36	2.00	1.86	2.72E+00	1	3
4.29	0.00	7.50	0.00	3.21	0.00	1.29	7.41E+00	1	3
7.50	0.00	1.07	5.36	0.00	1.00	1.71	2.69E+00	1	3
2.14	0.00	3.21	0.00	9.64	0.00	1.71	1.73E+01	1	3
6.43	0.00	5.36	0.00	2.14	0.00	1.43	9.81E+00	1	3
0.00	4.29	4.29	0.00	5.36	0.86	1.86	7.81E+00	1	3
2.14	0.00	7.50	0.00	4.29	1.57	1.29	3.62E+00	1	3

5.36	3.21	6.43	0.00	0.00	0.00	1.71	3.28E+00	1	3
10.71	0.00	0.00	0.00	4.29	0.00	1.57	2.49E+00	1	3
7.50	0.00	3.21	0.00	4.29	0.00	1.43	1.95E+01	1	3
5.36	0.00	1.07	0.00	7.50	0.00	0.57	1.61E+00	1	3