

Supporting information

Guided Synthesis of the stable sols based on nanosized titanium(IV) oxides with the predictable particle size and antimicrobial properties

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The code and dataset used in this article are available in our GitHub repository (<https://github.com/Kumokage/guided-synthesis-tio4>).

Table 1S. The characteristics of titanium(IV) oxide sols studied and the conditions of their synthesis.

№	Composition of reaction mixtures	Synthesis conditions				d, nm	N, %	S, day	
		T, °C	t, min	c(acid)	c(Ti ⁴⁺)				
	Organic sols								
1	H ₂ O + HNO ₃ + TiIPO + ButOH (mixture 1)	1	45	60	4	0.5	618.5	100.0	16
2		1	80	10	4	0.5	978.1	100.0	16
3		1	45	20	4	0.5	2.0	100.0	90
4		1	45	20	4	0.47	2.628	100.0	60
5	H ₂ O + HNO ₃ + TiIPO + IPOOH (mixture 2)	2	50	20	4	0.2	1712	100.0	16
6		2	50	30	4	0.2	889.6	100.0	16
7		2	80	20	4	0.2	1.7	100.0	16
8		2	45	60	0.3	0.14	>2000	100.0	2
9		2	60	60	0.3	0.14	>2000	100.0	0.5
10		2	60	15	0.3	0.14	>2000	100.0	0.5
11		2	45	130	0.1	0.28	8.3 21.3	99.5 0.5	9
12		2	45	83	0.26	0.14	>2000	100.0	2
13		2	25	61	0.26	0.14	>2000	100.0	2
14		2	45	56	0.26	0.14	>2000	100.0	2
15		2	25	60	0.53	0.14	832.4	100.0	6
16		2	20	58	0.53	0.14	716.2	100.0	2
17		2	80	60	0.1	0.14	>2000	100.0	0
18		2	45	130	0.1	0.28	5.4	100.0	2
19		3	50	30	4	0.3	2159	41.6	17

	H ₂ O + HNO ₃ +						487.2	58.4	
20	TiBut + ButOH	3	80	20	4	0.3	1021	100.0	90
21	(mixture 3)	3	45	60	0.3	0.35	>2000	100.0	2
22		3	60	60	0.3	0.35	>2000	100.0	2
23		3	60	30	0.3	0.35	>2000	100.0	2
24		3	60	60	0.3	0.17	>2000	100.0	0
25		3	80	20	0.3	0.17	>2000	100.0	0
26		3	60	40	0.3	0.17	>2000	100.0	0.5
27		3	45	70	0.8	0.17	>2000	100.0	0.5
28		3	20	50	1.58	0.15	>2000	100.0	2
29		3	20	80	1.58	0.15	>2000	100.0	2
30		3	20	60	2.38	0.15	>2000	100.0	2
31		3	25	60	2.38	0.15	>2000	100.0	2
32		3	45	20	4	0.47	0.7	100.0	90
33		3	45	20	4	0.47	2.628	100.0	>90
34		3	45	20	4	0.22	3096	100.0	>40
35		3	35	60	2	0.42	1.11	100	5
36		3	35	20	3	0.40	1.71	100	>90
37		3	35	90	2	0.38	3.46	100	>60
Hydrosols									
38	H ₂ O +	4	80	8	0.1	0.6	2.030	100.0	60
39	TiOSO ₄ × xH ₂ SO ₄ ×	4	85	9	0.1	0.6	2.1	100	60
40	yH ₂ O	4	80	9	0.1	0.6	2.422	100.0	10
41	(mixture 4)	4	80	10	0.1	0.6	2.101	100.0	10
42		4	80	11	0.1	0.6	2.269	100.0	10
43		4	80	12	0.1	0.6	1.753	96.6	10
44		4	85	11	0.1	0.6	1.332	98.8	10
45		4	88	9	0.1	0.6	2.496	100.0	40
46		4	88	10	0.1	0.6	2.307	99.3	40
47		4	89	9	0.1	0.6	1.878	100.0	10
48		4	89	10	0.1	0.6	2.069	100.0	10
49		4	93	11	0.1	0.6	2.763	100.0	40
50		4	93	12	0.1	0.6	3.219	99.7	40
51		4	71	9	0.1	0.6	1.893	100.0	40
52		4	71	10	0.1	0.6	1.958	100.0	40
53		4	71	11	0.1	0.6	2.176	100.0	40
54		4	71	12	0.1	0.6	2.185	100.0	40
55		4	65	12	0.1	0.6	1.377	97.5	40
56		4	75	12	0.1	0.6	3.304	100.0	40
57		4	85	12	0.1	0.6	>2000	100.0	0
58		4	70	12	0.1	0.62	2.900	99.5	40
59		4	70	12	0.1	0.59	1.901	100.0	40
60		4	70	12	0.1	0.55	2.841	100.0	40
61		4	70	12	0.1	0.52	2.162	97.8	40
62		4	80	8	0.1	0.6	2.197	100.0	60

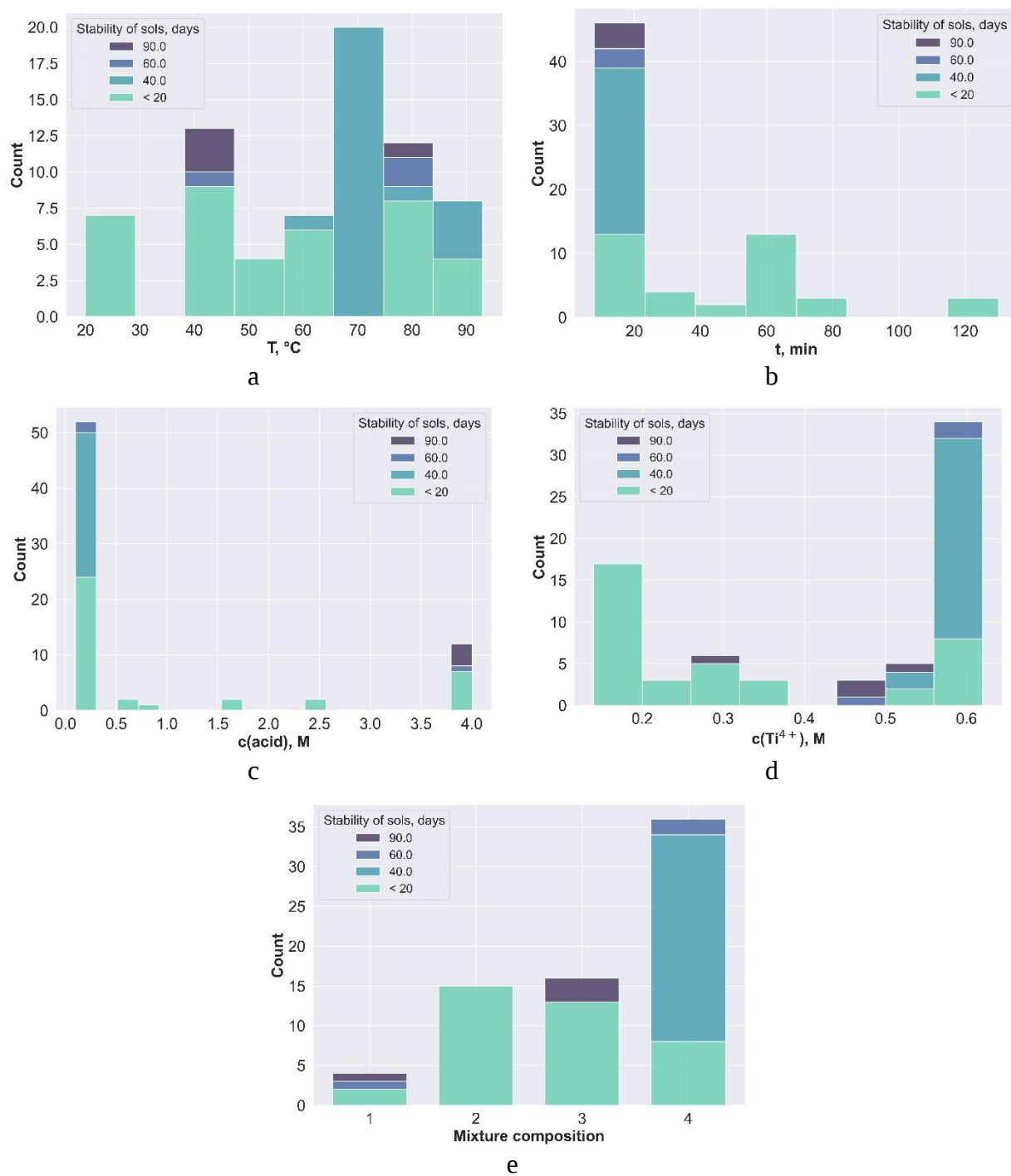


Fig. 1S. *First stage.* Parameters histograms categorized by sol stability (S, days): a – T , °C; b – t , min; c – $c(\text{acid})$, M; d – $c(\text{Ti}^{4+})$, M, e – mixture composition.

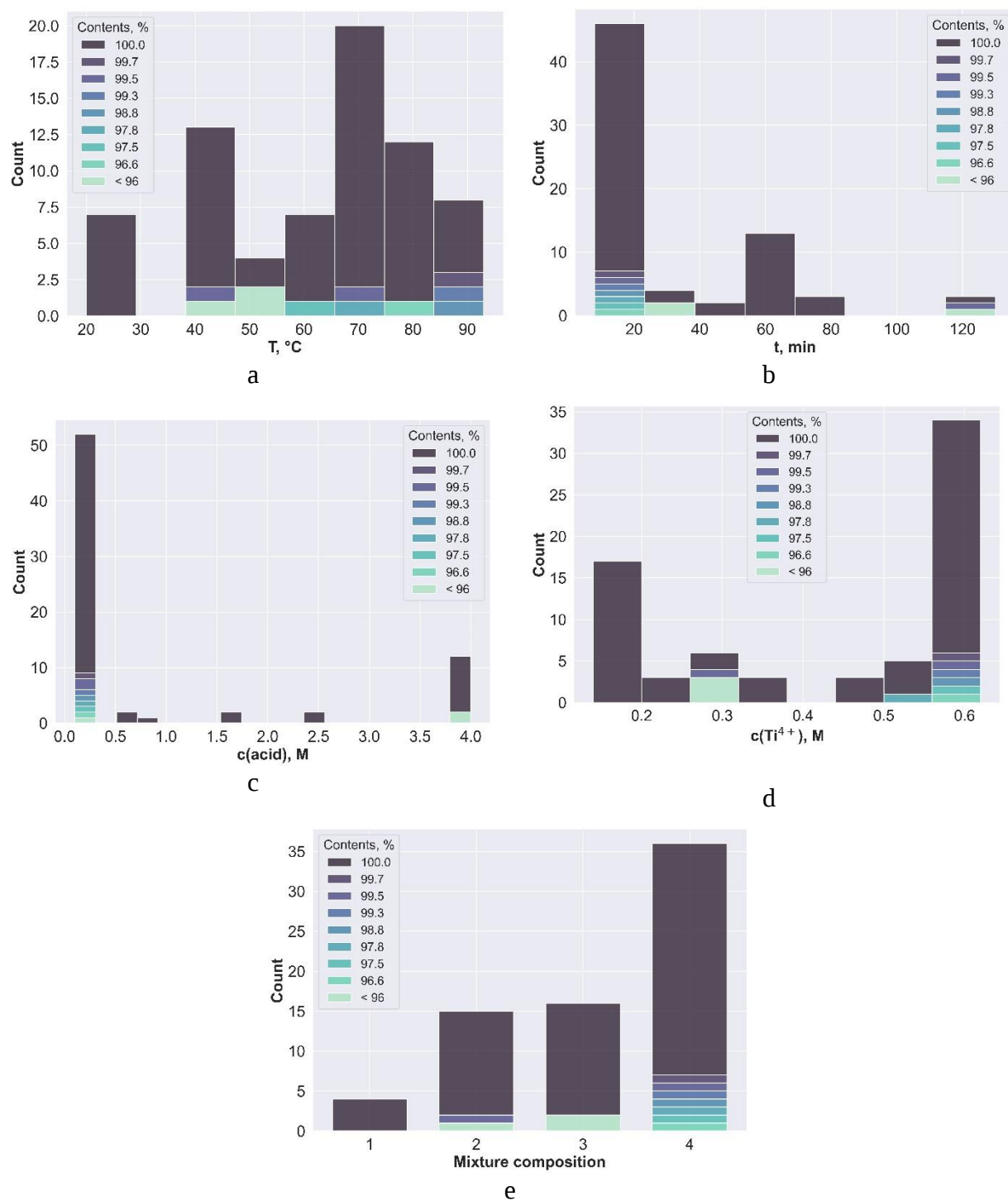


Fig. 2S. *First stage.* Parameters histograms categorized by the content of nanoparticles in a sol (N, %): (a) T , °C; (b) t , min; (c) $c(\text{acid})$, M; (d) $c(\text{Ti}^{4+})$, M, (e) mixture composition.

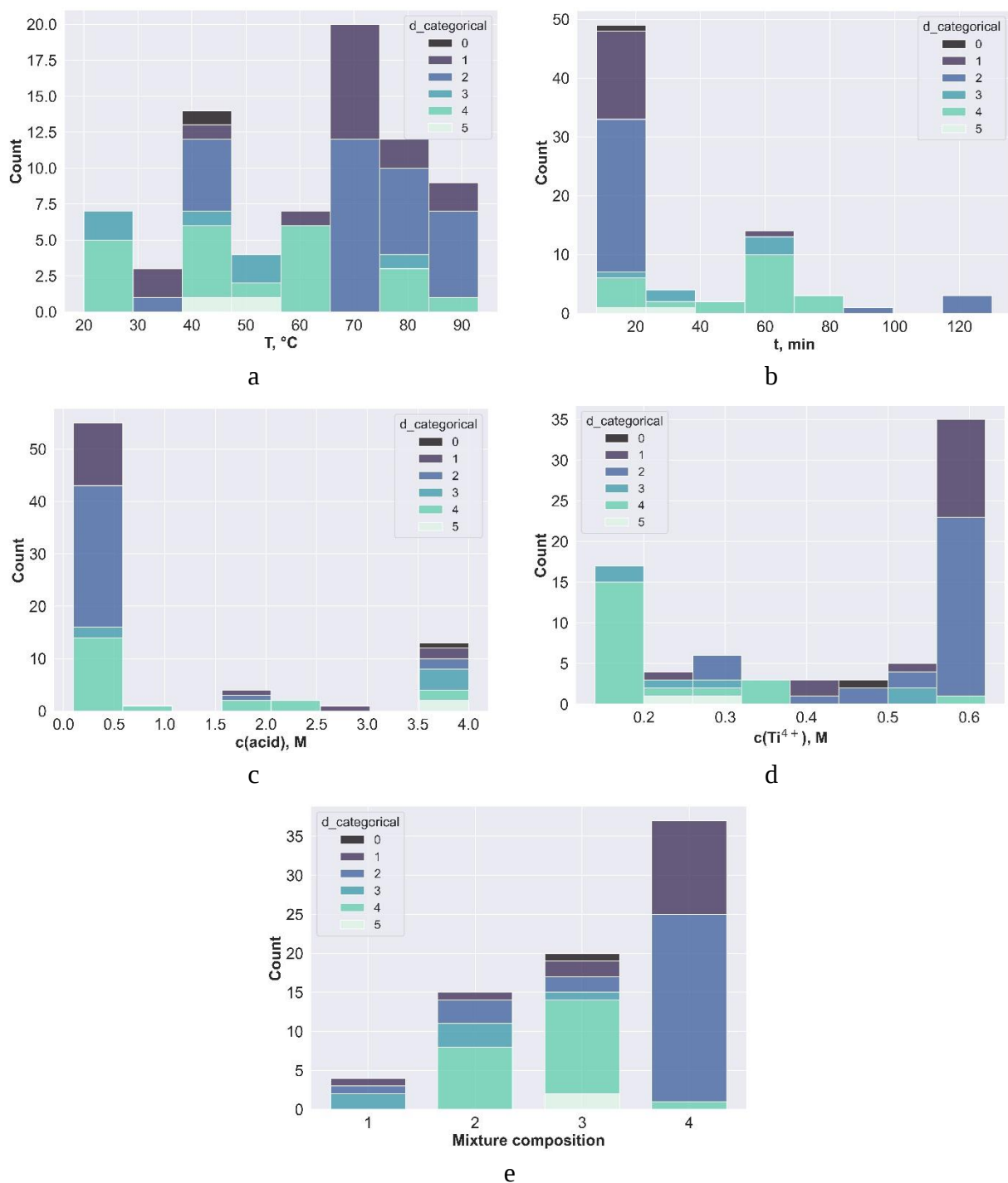


Fig. 3S. Second stage. Parameters histograms categorized by hydrodynamic diameter of titanium(IV) oxides particles in a sol (d , nm): (a) T , °C; (b) t , min; (c) $c(\text{acid})$, M; (d) $c(\text{Ti}^{4+})$, M, (e) mixture composition

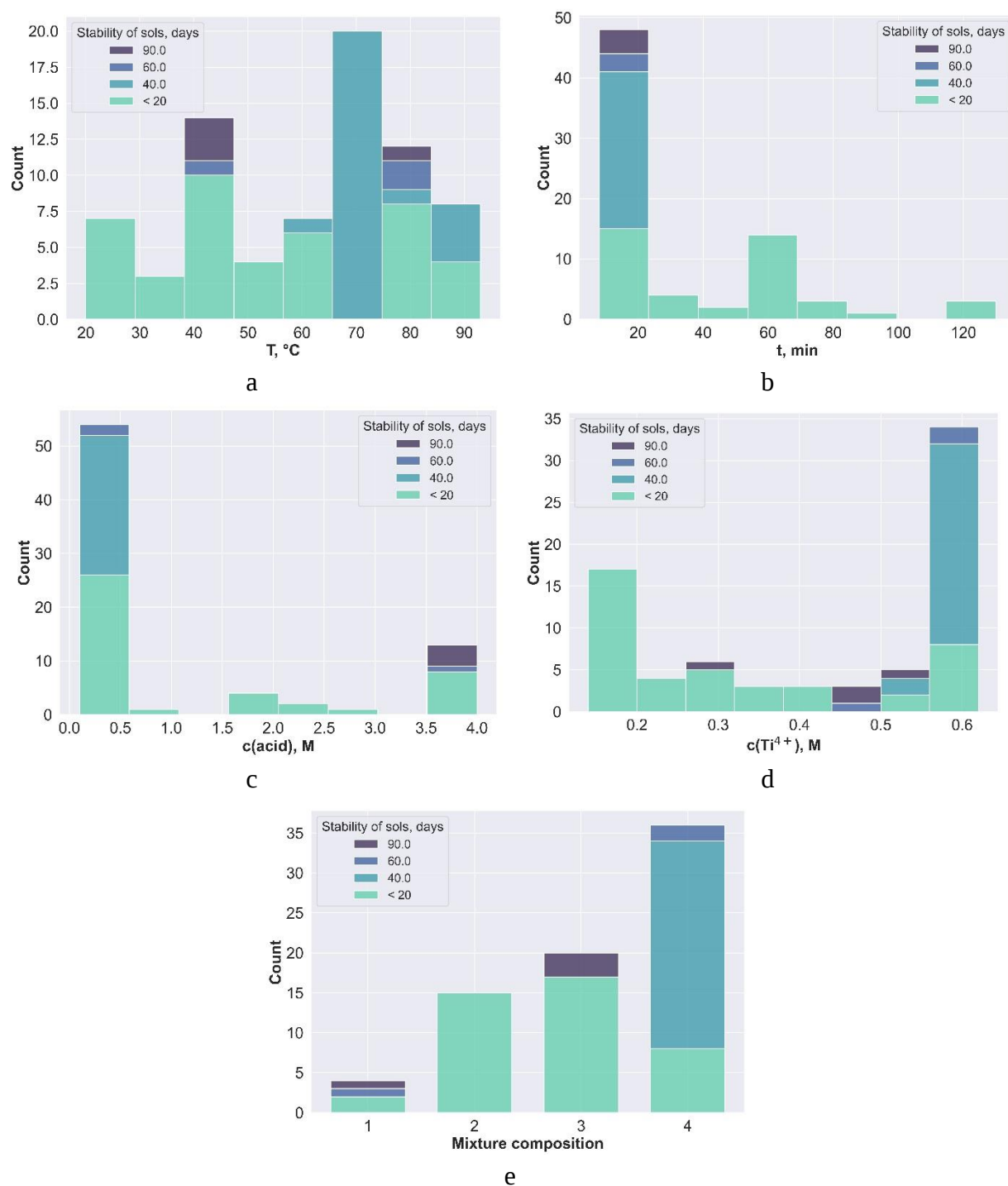


Fig. 4S. *Second stage.* Parameters histograms categorized by the sol stability (S, days): (a) T , °C; (b) t , min; (c) $c(\text{acid})$, M; (d) $c(\text{Ti}^{4+})$, M; (e) mixture composition

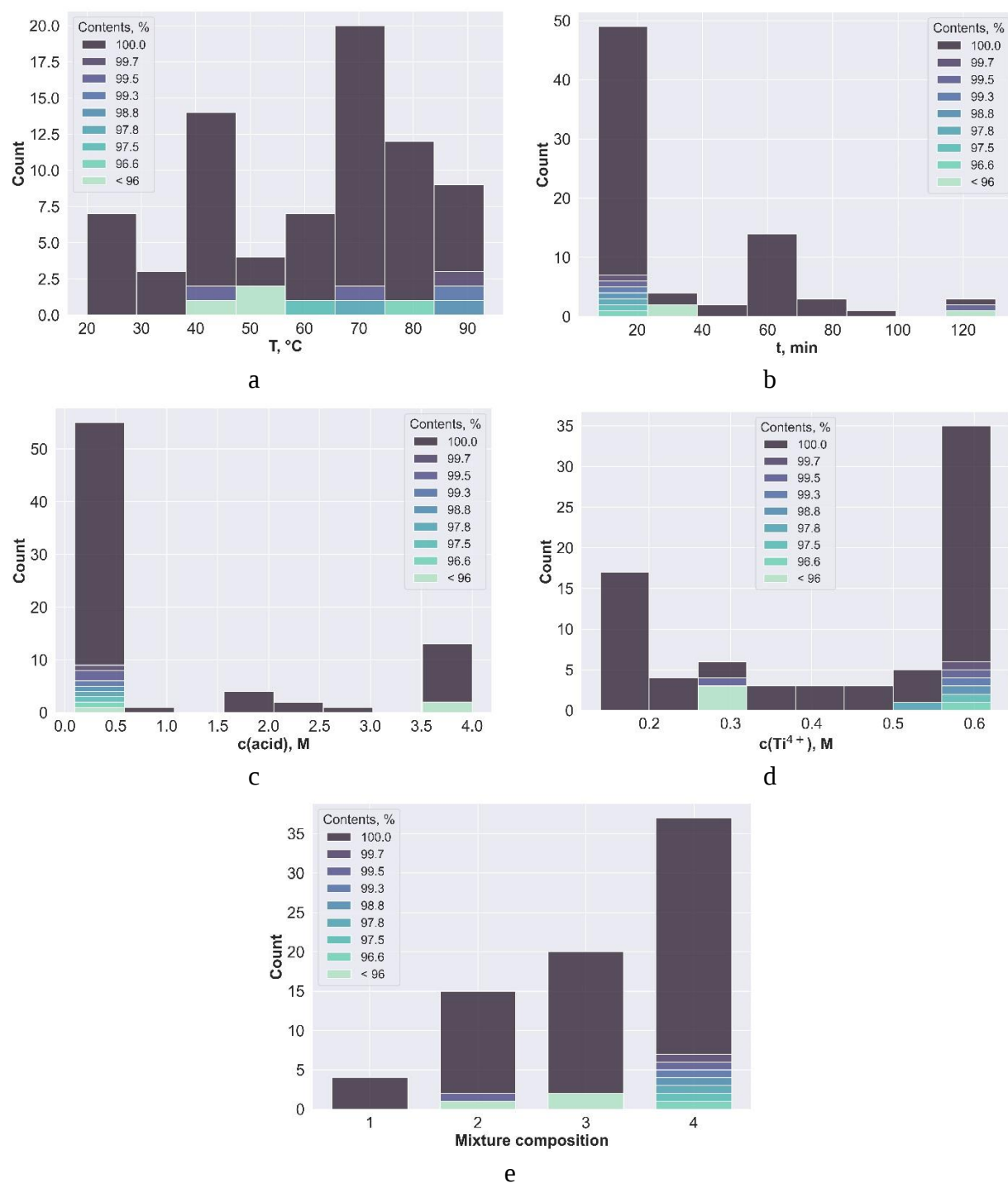


Fig. 5S. Second stage. Parameters histograms categorized by the particles content in a sol (N, %): (a) T, °C; (b) t, min; (c) c(acid), M; (d) c(Ti⁴⁺), M; (e) mixture composition