Appendix Table 1 for GSA Data Repository item 2002046

Table 1. Composition of brine inclusions in a root zone of a miarolitic quartz crystal analyzed by proton-induced X-ray emission (PIXE)

Inclusion No	Cl (wt%)	K (wt%)	Ca (wt%)	Ti (ppm)	Mn (wt%)	Fe (wt%)	Cu (ppm)	Zn (wt%)	As (ppm)	Br (ppm)	Rb (ppm)	Sr (ppm)	Sn (ppm)	Pb (wt%)
1-1*	nq	nq	nq	91	2.17	3.56	332	1.10	543	4000	567	278	1500	22.10
1-2	24.90	5.40	0.72	151	1.14	4.86	198	1.81	502	2000	641	bdl	421	6.98
2-1	39.50	6.77	3.56	400	1.75	9.81	492	0.96	16	751	1190	446	586	0.38
2-2	3.74	0.24	0.04	28	0.09	0.56	18	0.04	38	39	121	bdl	bdl	0.02
2-3	31.90	4.44	0.46	278	0.70	4.62	310	0.34	bdl	250	808	bdl	231	0.44
2-4	34.50	3.03	0.41	109	0.86	6.00	184	0.42	533	383	1100	bdl	860	0.18
3-1	nq	nq	0.43	213	0.46	2.44	114	0.17	25	178	353	bdl	bdl	0.08
3-2	nq	nq	nq	481	1.13	6.18	278	0.59	85	578	595	281	bdl	0.27
3-3*	40.50	5.80	1.60	110	0.96	5.13	286	0.42	bdl	382	637	98	264	0.21
3-4	12.20	1.07	0.19	114	0.39	2.96	48	0.15	242	146	bdl	bdl	bdl	0.07
3-6	40.10	4.10	0.89	147	0.99	4.47	83	0.35	174	364	416	bdl	bdl	0.16
3-7	nq	nq	0.28	190	1.15	7.48	466	1.05	165	1160	1200	573	bdl	0.55
4-1	41.10	11.70	1.11	182	1.86	10.93	220	0.84	782	897	2100	bdl	1100	0.43
4-2	8.10	0.60	6.00	844	0.05	0.73	135	0.06	209	bdl	bdl	bdl	bdl	bdl
4-3	18.30	8.50	bdl	151	0.68	1.18	132	0.33	156	303	636	bdl	bdl	0.24
4-6	35.30	6.70	0.78	305	1.16	8.06	712	0.70	124	511	1400	bdl	1200	0.25
4-7	4.08	2.49	0.44	164	0.65	4.17	157	0.29	156	307	560	bdl	353	0.13
4-8	nq	nq	0.32	443	0.52	2.92	248	0.29	61	268	293	bdl	689	0.12
4-9	39.20	13.20	1.80	354	3.05	19.62	922	1.58	1100	1500	3400	bdl	1700	0.74
4-10	8.40	3.36	0.59	115	1.23	8.56	218	0.57	bdl	609	1600	bdl	701	0.29
5-1	37.40	9.60	1.82	151	1.46	7.80	134	0.87	bdl	742	979	261	829	0.47
5-2	44.50	10.00	3.86	28	1.63	7.20	364	0.80	190	582	317	164	388	0.15
5-3*	55.30	19.00	3.10	137	1.89	8.69	327	1.01	bdl	703	1000	309	626	0.50
5-4	47.70	6.10	1.75	147	1.42	7.61	301	0.63	bdl	255	357	212	604	0.33
5-5	12.70	3.61	0.69	40	0.58	2.74	76	0.32	45	269	339	120	392	0.13
5-6	13.70	3.26	1.47	127	0.83	4.39	103	0.30	170	303	391	131	bdl	0.04
6-1	29.80	4.40	0.94	27	0.86	4.23	316	0.38	46	316	432	bdl	607	0.15
7-1*	3.48	0.85	0.62	72	0.19	0.58	77	0.53	47	281	322	201	756	0.21
8-1	2.57	0.28	0.07	39	0.10	0.39	19	0.05	25	45	74	bdl	71	0.02
8-2	6.10	1.13	0.16	541	0.07	0.88	149	0.03	bdl	bdl	bdl	bdl	317	0.03
8-3	nq	nq	nq	308	1.61	6.39	155	0.53	550	631	1500	bdl	901	0.28

Note : The concentrations were calculated by assuming a bulk density of 1.8 g/cm^3 (Naumov and Sokolov, 1981). PIXE analytical parameters are given in the caption to Figure 3.

* Inclusions are shown in Figure 3.

Abbreviations:

nq - not quantified due to significant depth of the inclusion beneath the surface;

bdl - below detection limit.

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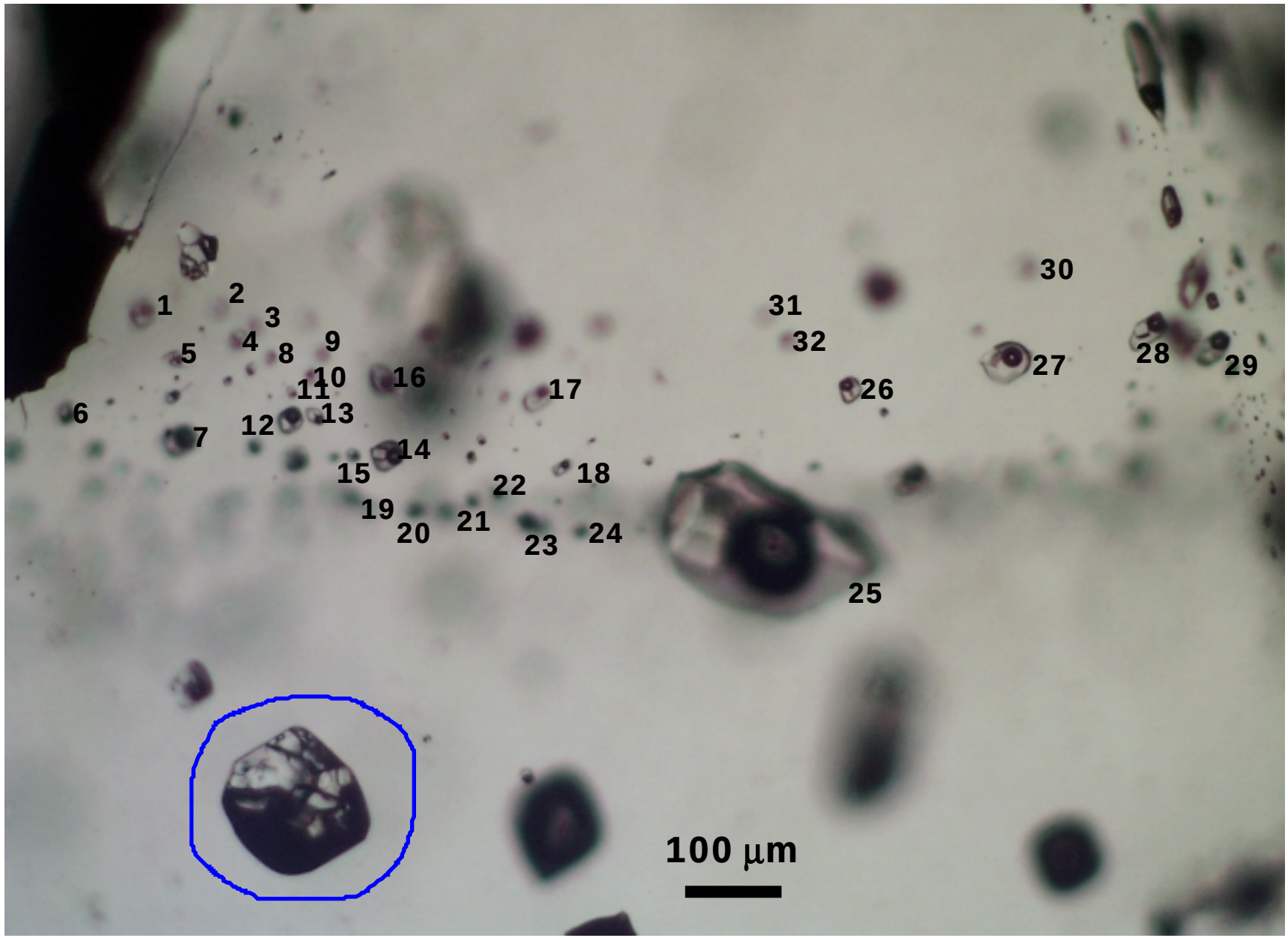
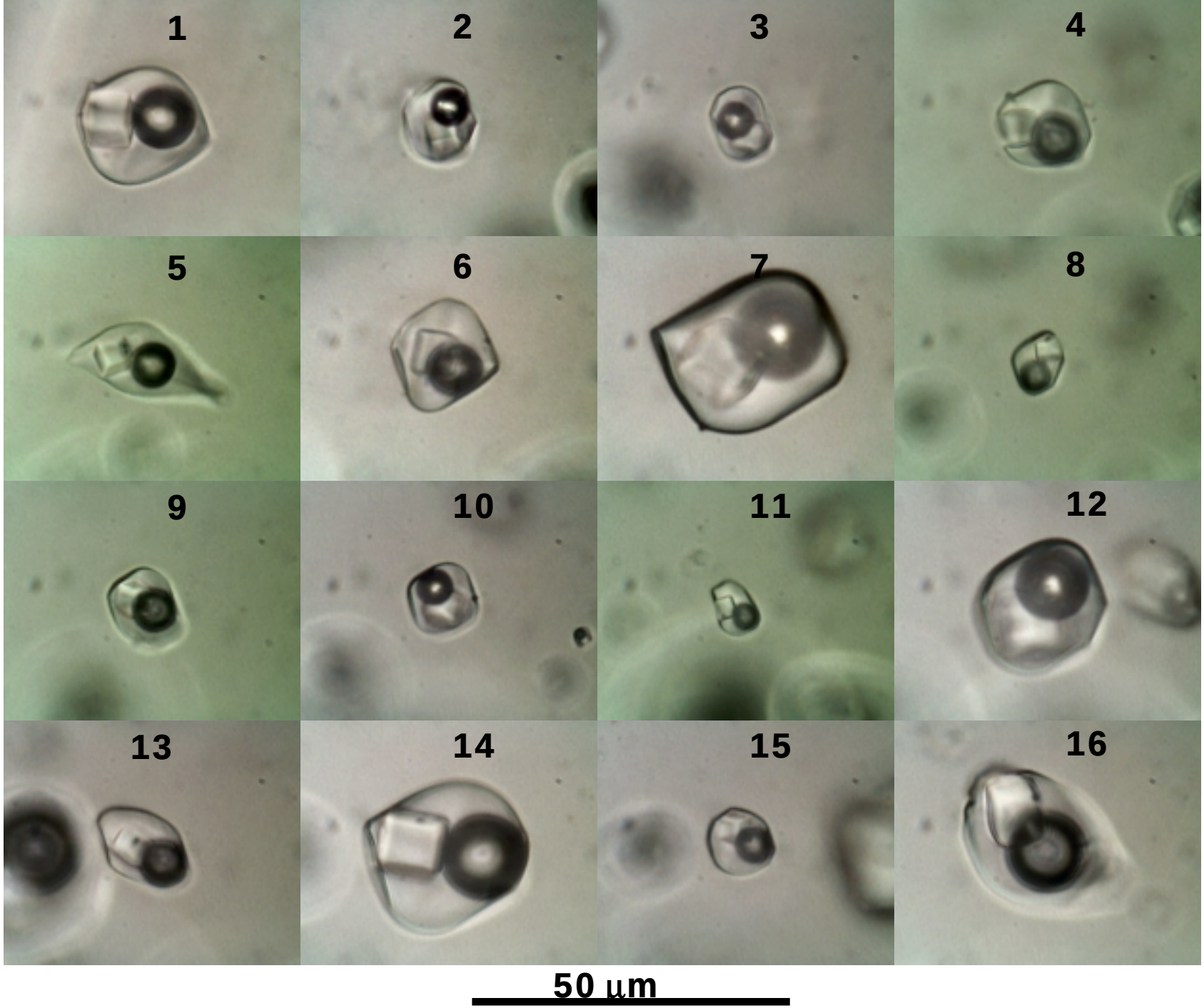
Attached Figure A: Linear dimensions and proportions in three-phase (liquid+halite+bubble) fluid inclusions (FI) in a trapping plane (miarolitic quartz, Industrialnoe Sn-granite, NE Russia

N	X-FI (μm)	Y-FI (μm)	average-FI (μm)	Bubble (μm)	Halite (μm)		Ratio (Bubble/FI)	Ratio (Halite/FI)
1	19.8	18.1	19.0	9.5	6.0		0.50	0.32
2	12.9	11.2	12.1	6.0	4.3		0.50	0.36
3	11.2	7.8	9.5	4.7	3.4		0.50	0.36
4	12.9	12.9	12.9	6.5	4.7		0.50	0.37
5	16.4	10.3	13.4	6.5	4.3		0.48	0.32
6	14.7	14.7	14.7	7.3	5.2		0.50	0.35
7	26.7	21.6	24.1	12.1	8.6		0.50	0.36
8	9.5	7.8	8.6	4.3	3.0		0.50	0.35
9	12.1	9.5	10.8	5.6	3.4		0.52	0.32
10	10.3	10.3	10.3	5.2	3.4		0.50	0.33
11	8.6	6.0	7.3	3.4	2.6		0.47	0.35
12	21.6	18.1	19.8	10.3	6.9		0.52	0.35
13	15.5	10.3	12.9	6.9	4.3		0.53	0.33
14	25.9	23.3	24.6	12.9	7.8		0.53	0.32
15	10.3	9.5	9.9	5.2	3.4		0.52	0.35
16	24.1	19.0	21.6	11.2	7.8		0.52	0.36
17	19.0	13.8	16.4	7.8	6.0		0.47	0.37
18	16.4	7.8	12.1	6.0	4.3		0.50	0.36
19	14.7	12.9	13.8	6.9	4.7		0.50	0.34
20	16.4	16.4	16.4	7.8	5.2		0.47	0.32
21	12.1	9.5	10.8	5.2	3.4		0.48	0.32
22	11.2	8.6	9.9	5.2	3.4		0.52	0.35
23	14.7	13.8	14.2	6.9	5.2		0.48	0.36
24	12.9	10.3	11.6	6.0	4.3		0.52	0.37
25	159.5	99.1	129.3	64.7	43.1		0.50	0.33
26	19.0	15.5	17.2	8.6	6.0		0.50	0.35
27	36.2	28.4	32.3	16.4	12.1		0.51	0.37
28	34.5	17.2	25.9	12.9	9.5		0.50	0.37
29	31.9	17.2	24.6	12.1	8.6		0.49	0.35
30	16.4	12.9	14.7	7.8	5.2		0.53	0.35
31	12.1	8.6	10.3	5.2	3.9		0.50	0.38
32	12.9	11.2	12.1	6.0	4.3		0.50	0.36
						average	**0.50**	**0.35**
						stdev	**0.02**	**0.02**
						%	**3.3**	**5.1**

Attached Figure A: A trail of three-phase (liquid + bubble + halite) inclusions in miarolitic quartz, Industrialnoe Sn-granite, NE Russia

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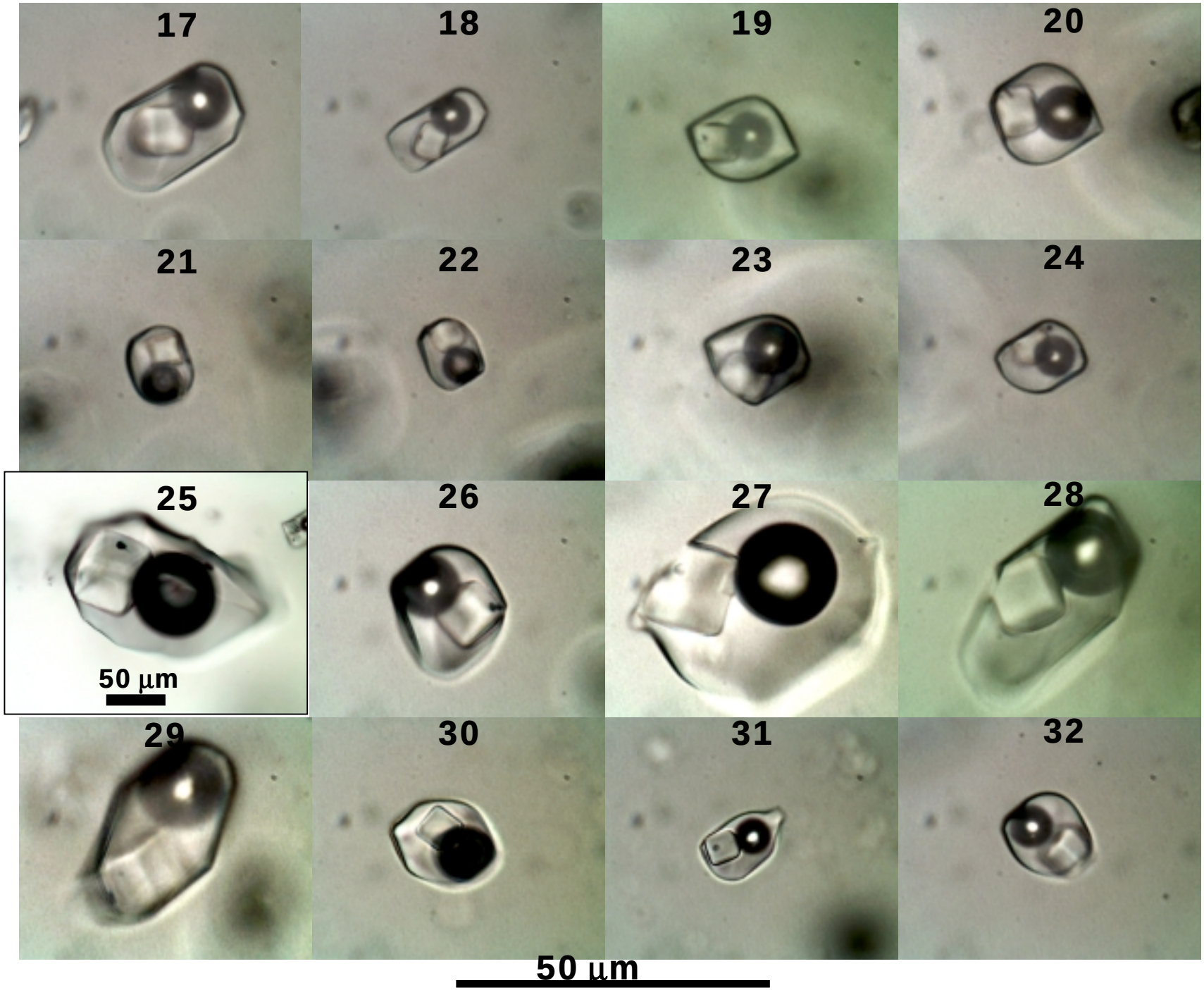
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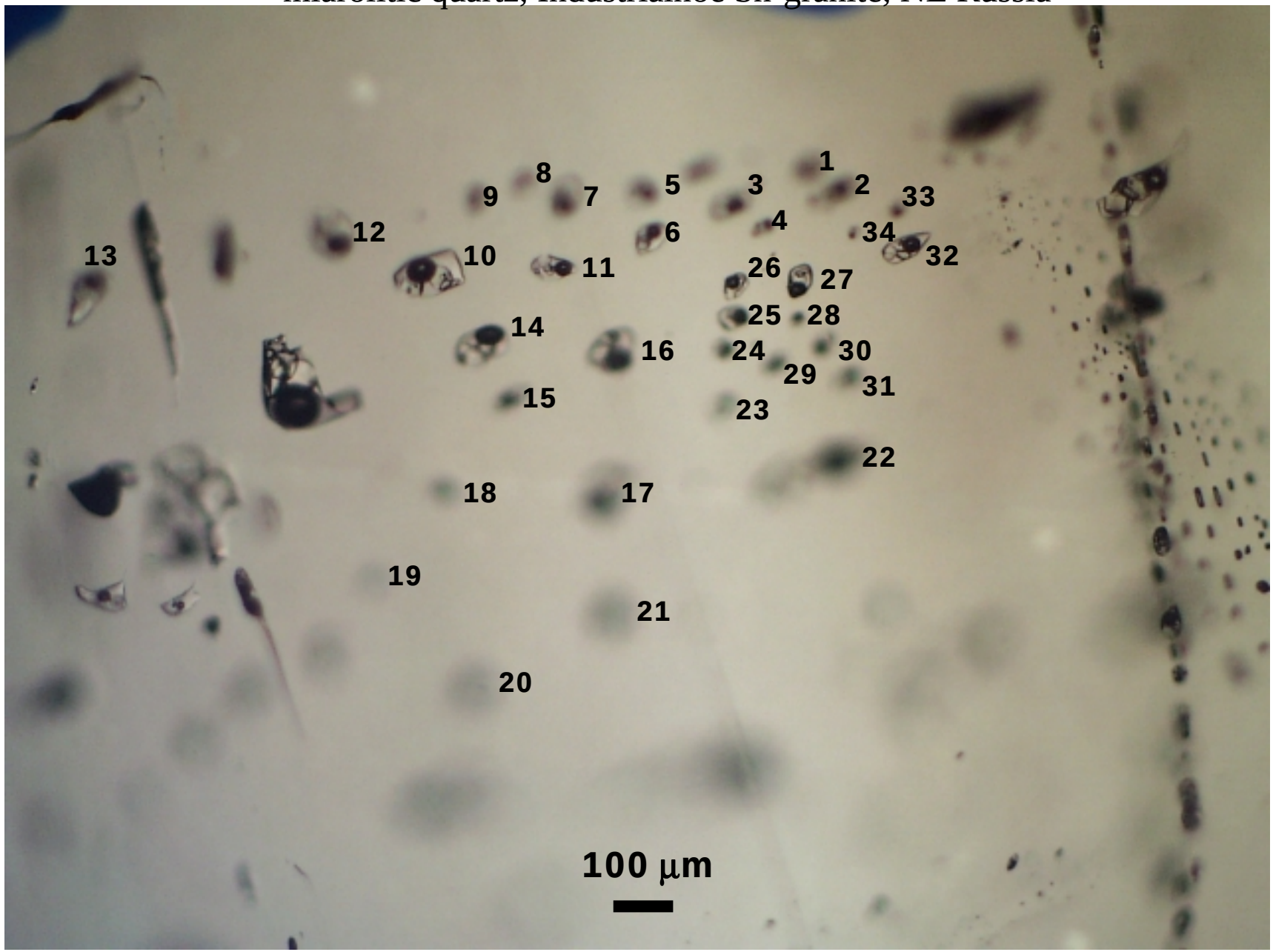
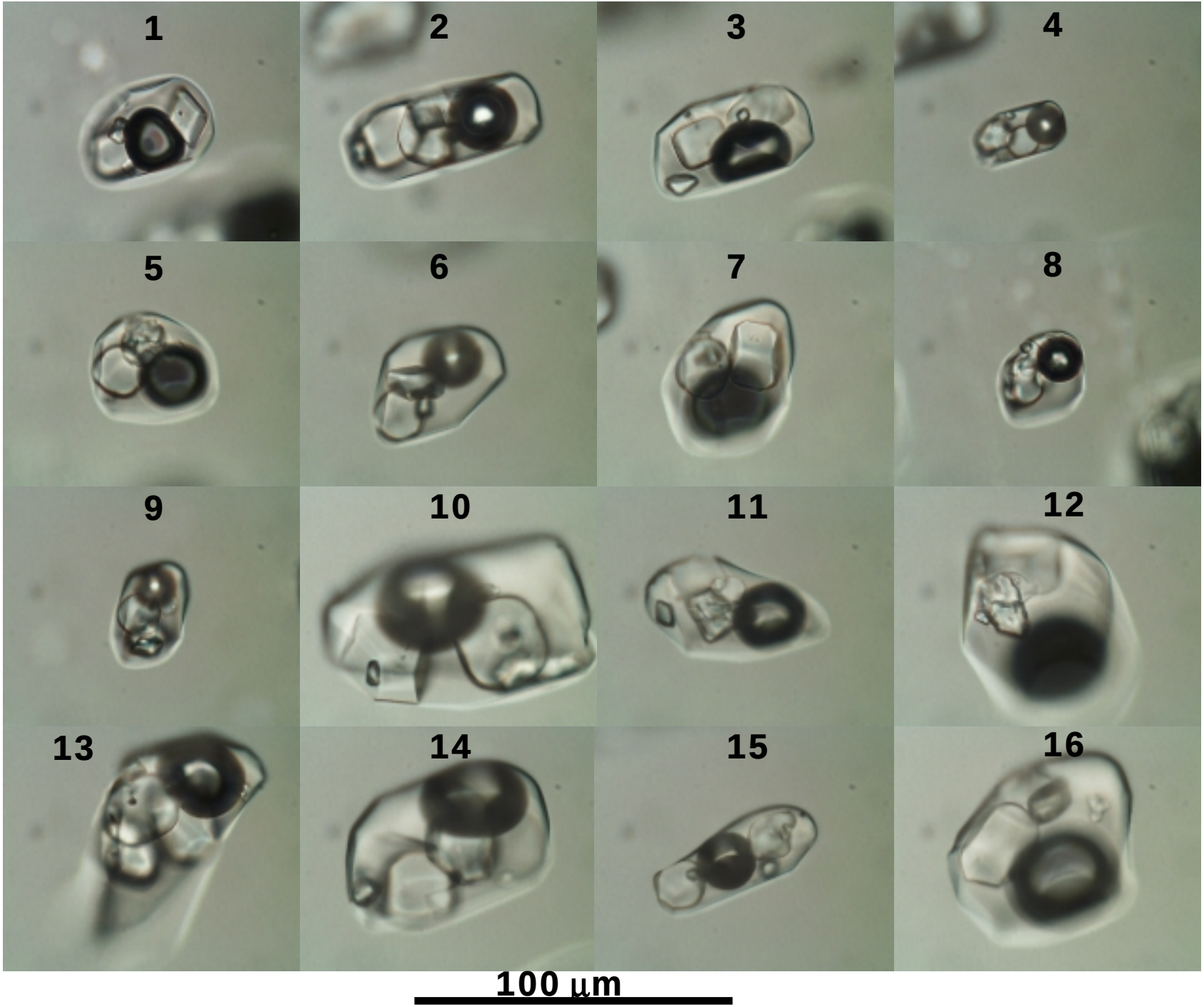
Attached Figure B: Linear dimensions and proportions in multiphase (liquid+bubble+daughter crystals) fluid inclusions (FI) in a trapping plane (miarolitic quartz, Industrialnoe Sn-granite, NE Russia

N	X-FI (μm)	Y-FI (μm)	average-FI (μm)	X-bubble (μm)	Y-bubble (μm)	average bubble(μm)	Ratio (Bubble/FI)
1	41.4	27.6	34.5	19.0	17.2	18.1	0.53
2	62.1	22.4	42.2	20.7	20.7	20.7	0.49
3	51.7	27.6	39.7	25.9	17.2	21.6	0.54
4	29.3	15.5	22.4	12.1	12.1	12.1	0.54
5	37.9	34.5	36.2	19.0	19.0	19.0	0.52
6	46.6	31.0	38.8	19.0	19.0	19.0	0.49
7	55.2	37.9	46.6	24.1	20.7	22.4	0.48
8	34.5	24.1	29.3	13.8	13.8	13.8	0.47
9	34.5	20.7	27.6	13.8	13.8	13.8	0.50
10	84.5	48.3	66.4	32.8	29.3	31.0	0.47
11	51.7	27.6	39.7	22.4	19.0	20.7	0.52
12	60.3	51.7	56.0	27.6	25.9	26.7	0.48
13	69.0	34.5	51.7	25.9	22.4	24.1	0.47
14	67.2	46.6	56.9	32.8	24.1	28.4	0.50
15	55.2	20.7	37.9	19.0	17.2	18.1	0.48
16	67.2	50.0	58.6	32.8	25.9	29.3	0.50
17	77.6	48.3	62.9	36.2	25.9	31.0	0.49
18	32.8	25.9	29.3	15.5	15.5	15.5	0.53
19	29.3	22.4	25.9	13.8	12.1	12.9	0.50
20	43.1	41.4	42.2	22.4	20.7	21.6	0.51
21	51.7	36.2	44.0	25.9	20.7	23.3	0.53
22	137.9	41.4	89.7	46.6	39.7	43.1	0.48
23	36.2	25.9	31.0	15.5	15.5	15.5	0.50
24	27.6	25.9	26.7	13.8	13.8	13.8	0.52
25	36.2	31.0	33.6	17.2	17.2	17.2	0.51
26	36.2	25.9	31.0	15.5	15.5	15.5	0.50
27	43.1	29.3	36.2	19.0	17.2	18.1	0.50
28	22.4	13.8	18.1	8.6	8.6	8.6	0.48
29	34.5	22.4	28.4	14.7	13.8	14.2	0.50
30	32.8	24.1	28.4	15.5	13.8	14.7	0.52
31	37.9	25.9	31.9	16.4	15.5	15.9	0.50
32	63.8	29.3	46.6	29.3	19.0	24.1	0.52
33	25.9	19.0	22.4	12.1	10.3	11.2	0.50
34	15.5	12.1	13.8	6.9	6.9	6.9	0.50
						average	**0.50**
						stdev	**0.02**
						%	**4.0**

Attached Figure B: A trail of multiphase (liquid + bubble + daughter crystals) inclusions in miarolitic quartz, Industrialnoe Sn-granite, NE Russia

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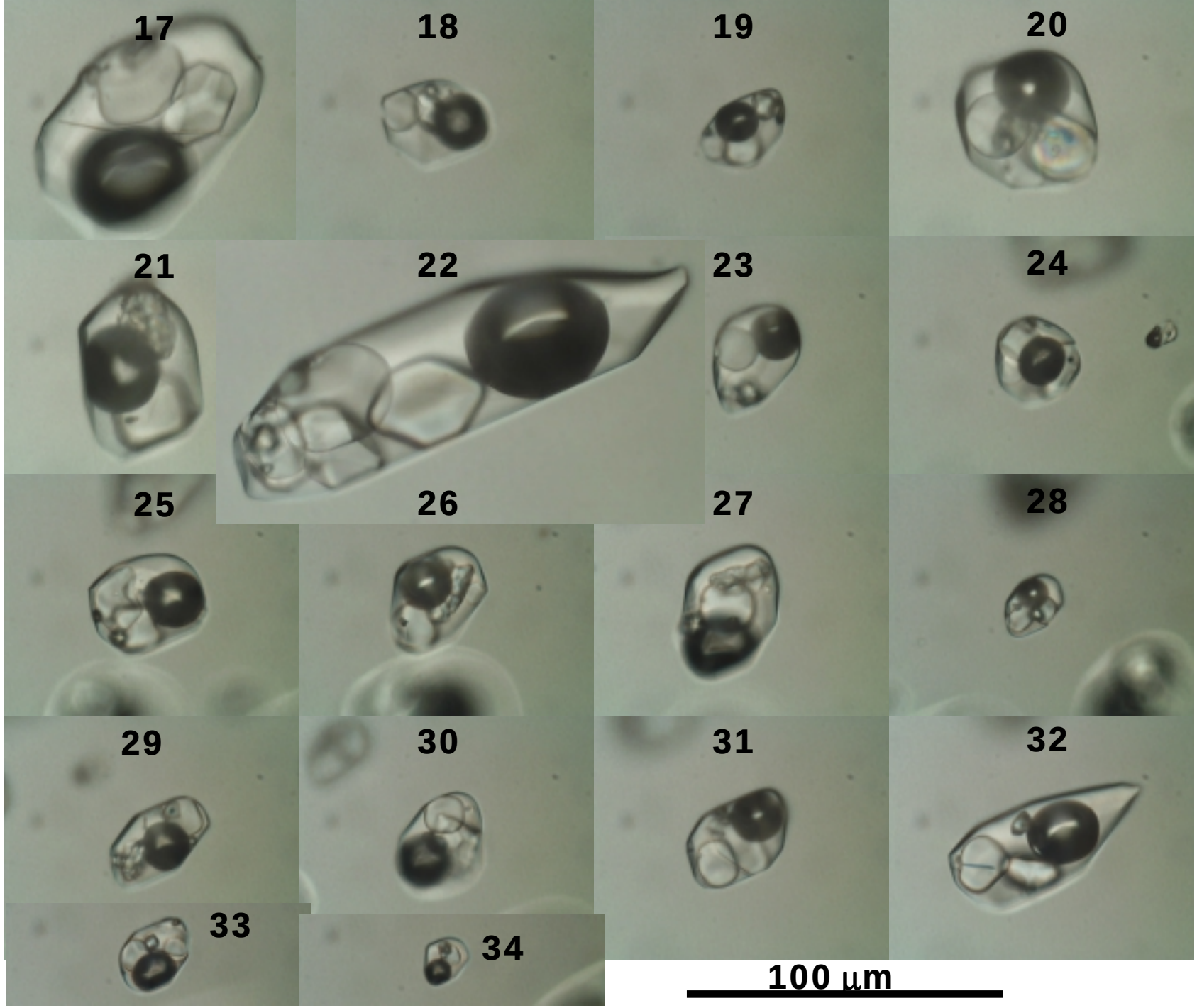
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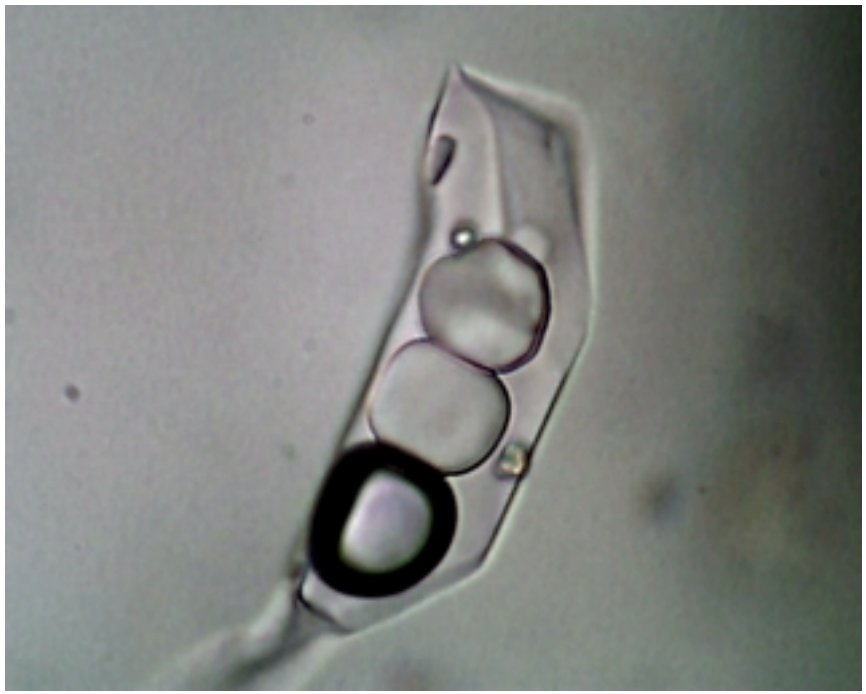
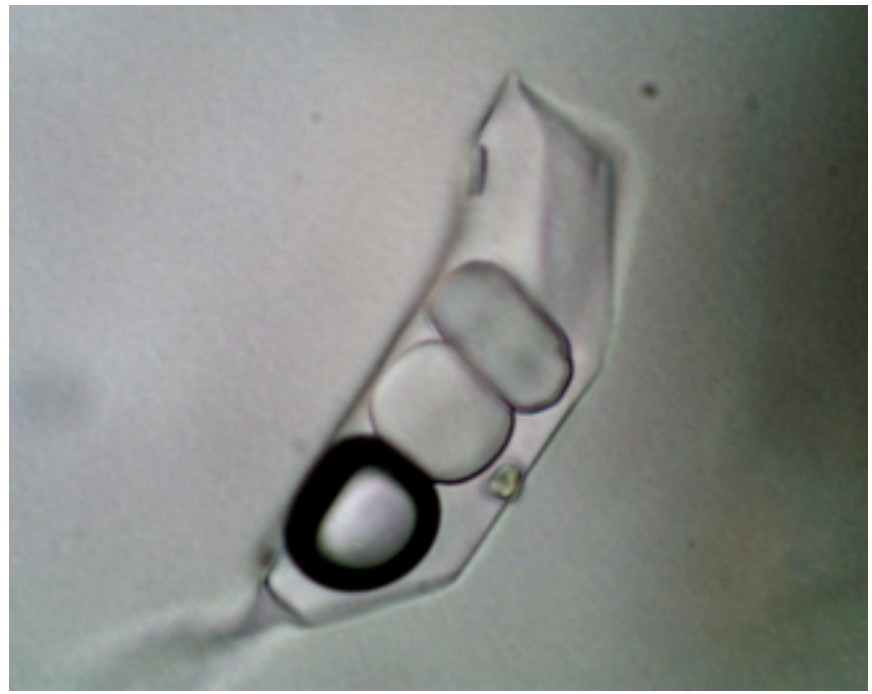
Attached Figure C:
Spontaneous recrystallization in a brine inclusion at room temperature





Attached Figure D: Heating experiment with a brine inclusion in miarolitic quartz, Industrialnoe Sn-granite

22°C

140°C

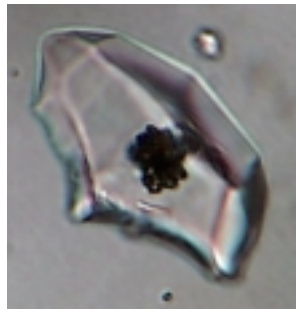
234°C

282°C

355°C

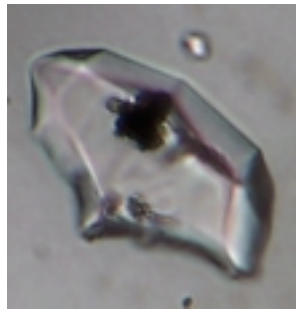
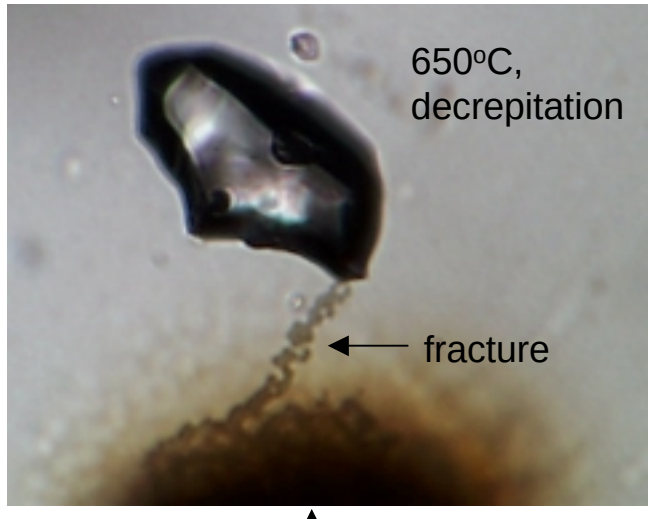
430°C

480°C



550°C

593°C



618°C