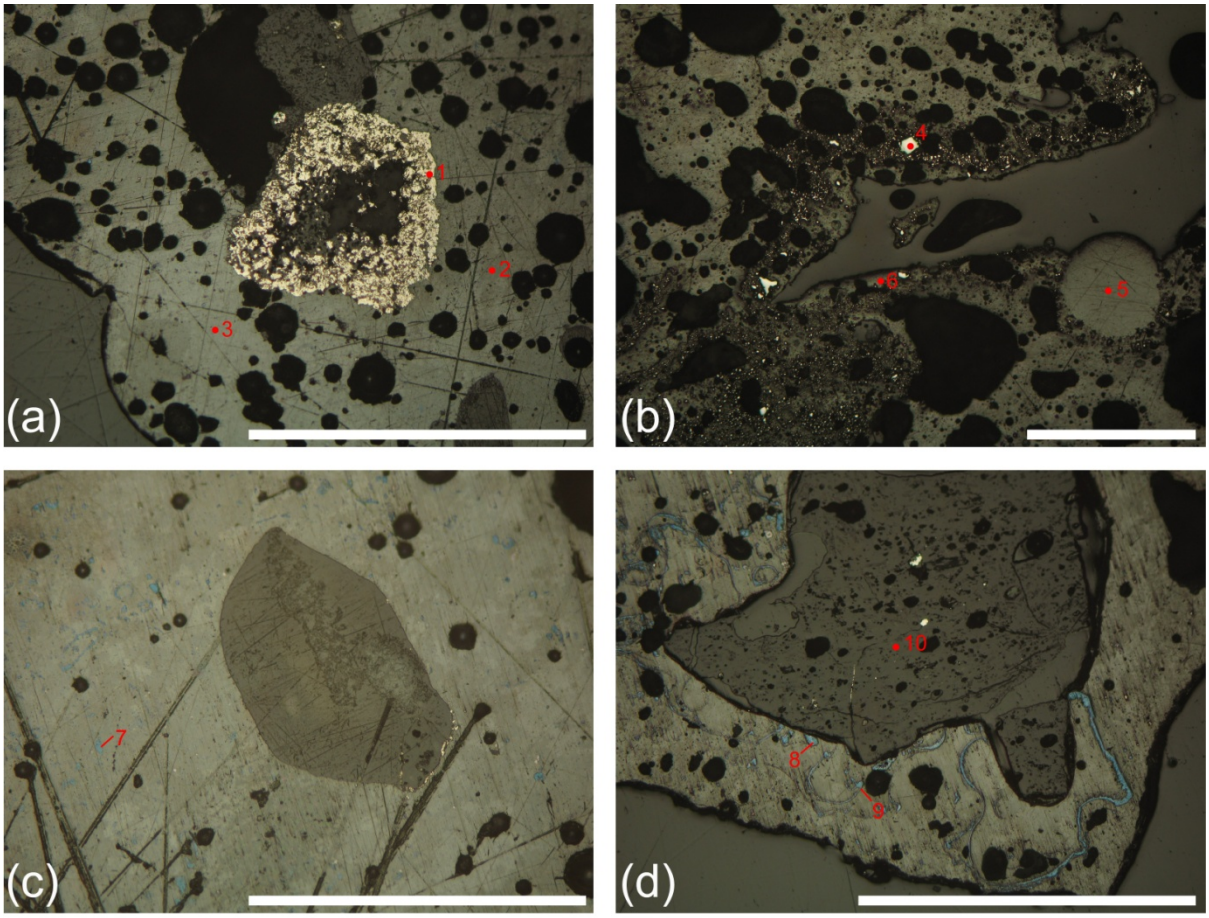
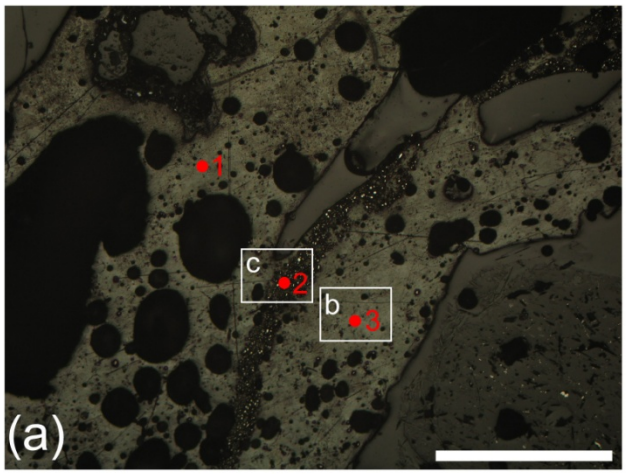
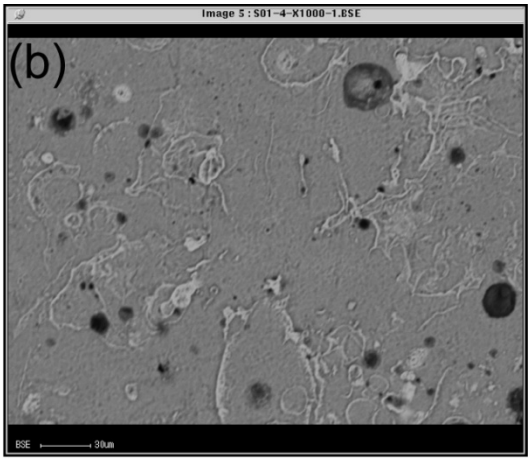
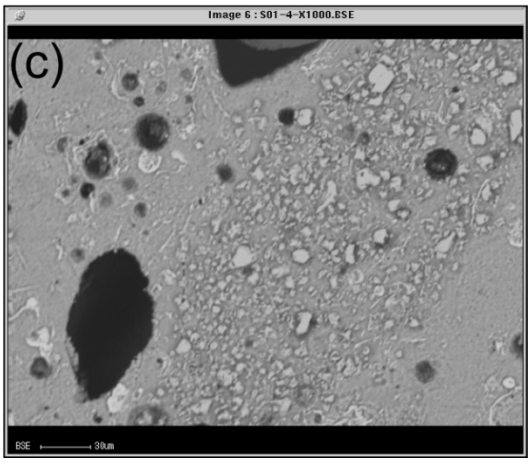


WDX (Semi-quantitative analysis)
1 - pyrite: Si, 2.6%; S, 54.4%; Fe, 41.8%; Cu, 0.3%; As, 0.3%; Mo, 0.5%
2 - gray sulfur: S, 95.0%; Fe, 0.2%; Cu, 3.6%; Mo, 0.9%; Zn, 0.2%
3 - gray sulfur: S, 88.4%; Fe, 0.1%; Cu, 10.2%; Mo, 0.8%; Ni, 0.2%
4 - pyrite: S, 52.8%; Fe, 46.3%; As, 0.2%; Mo, 0.5%
5 - gray sulfur: S, 96.8%; Fe, 0.1%; Cu, 1.8%; Mo, 1.3%
6 - gray sulfur: S, 84.3%; Fe, 5.6%; Cu, 9.2%; Mo, 0.9%
7 - blue inclusion (covellite): S, 32.6%; Fe, 0.5%; Cu, 66.5%; Mo, 0.3%
8 - blue inclusion (covellite): S, 32.5%; Fe, 0.1%; Cu, 66.7%; Mo, 0.3%, As, 0.3%
9 - blue inclusion (covellite): S, 32.4%; Fe, 0.3%; Cu, 62.1%; Mo, 0.3%, As, 4.5%
10 - silicate grain: SiO2, 68.7; Al2O3, 9.7; FeO, 1.7; CaO, 3.4; MgO, 0.8

Figure DR1. Photomicrographs of the polished molten sulfur samples from the MTJ-1 caldera. Red dots with number indicate the points for WDX analysis. (a) sulfide (pyrite) grain trapped within gray sulfur matrix. The gray sulfur matrix are highly enriched in Cu (points 2 and 3). (b) Trapped pyrite grains are usually observed near pore or opening (see Figure A2). (c) and (d) Silicates grains trapped within gray sulfur. Various sized and shaped blue-colored inclusions (covellite) are ubiquitous within gray sulfur matrix, which may explain the high Cu contents in the sulfur matrix. Scale bars are 1 mm.







WDX (Semi-quantitative analysis)
1. gray sulfur
S, 94.3%; Fe, 0.2%; Cu, 4.4%; Mo, 1.1%

2. gray sulfur with sulfide (pyrite)
S, 70.0%; Fe, 28.7%; Cu, 0.4%; Mo, 0.8%; As, 0.1%

3. gray sulfur
S, 98.6%; Cu, 0.2%; Mo, 1.0%

Figure DR2. (a) Photomicrographs of polished molten sulfur materials, showing different occurrence of covellite and pyrite. Red dots with number indicate the points for WDX analysis. Boxes labeled with b and c indicate the area for BSE images for (b) and (c). Scale bar is 1 mm. (b) BSE image (x 1000) for gray sulfur matrix without trapped pyrite. Covellite inclusions occur as small anhedral blebs and bubble-like shapes, which may indicate those covellites were directly precipitated from gas phase. The low Cu content in point 3 suggests that observed high Cu content in sulfur matrix might result from covellite inclusions. (c) BSE image (x 1000) for gray sulfur matrix with trapped pyrite grains. Unlike covellite, pyrite grains show more crystallized euhedral to subhedral shapes and concentrated near pore, which suggests that those pyrite were trapped into the molten sulfur as foreign material.

Table DR1. Elemental compositions of the molten sulfur, fresh dacite, altered dacite, and NELSC chimney

		sulfur 01 MTJ-1 sulfur flow	sulfur 02 MTJ-1 sulfur flow	sulfur 03 MTJ-1 massive	sulfur 04 MTJ-1 tabular	mean	mean* MTJ-1 fresh dacite	DG061804 MTJ-1 altered dacit	DG061805 MTJ-1 altered dacit	DG062004 MTJ-1 altered dacit	mean altered dacite	H06 DG12-1 NELSC chimney	H06 DG12-2 NELSC chimney	H06 DG12-3 NELSC chimney	H06 DG12-3 NELSC chimney	H06 DG12-3 NELSC chimney	mean chimney
Au	ppm	2.8	2.8	1.0	0.1	1.7	n.a.	n.a.	0.03	0.04	0.04	1.08	0.77	2.23	1.79	1.96	1.6
Ag	ppm	0.7	0.6	0.9	1.2	0.9	n.a.	n.a.	n.a.	n.a.	n.a.	1.2	1.2	31.7	3.2	29.3	13.3
Fe	%	0.62	1.03	0.11	0.99	0.69	5.39	5.71	4.7	11.05	7.2	43.1	38.2	28.6	33.7	26.5	34.0
Cu	ppm	20700	21500	15900	12100	17550.0	121	199	145	253	199.0	34706.7	36300	36200	141000	28100	55261.3
Zn	ppm	99	19	17	52	46.8	94	190	76	73	113.0	658.7	209	27700	1490	26000	11211.5
Pb	ppm	2	< 2	< 2	3	2.5	-	-	-	-	n.a.	47.0	47	258	73	262	137.4
As	ppm	301	252	488	641	420.5	n.a.	8.9	9	17	11.6	248.7	160	360	723	260	350.3
Ba	ppm	2	6	2	5	3.8	276	250	251	170	223.7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Ca	%	< 0.01	0.03	< 0.01	0.04	0.04	3.79	3.72	2.57	0.56	2.3	0.0	< 0.01	0.01	< 0.01	< 0.01	0.0
S	%	19.93	15.45	18.34	13.74	16.9	n.a.	0.384	6.45	14.7	7.2	17.7	18.38	17.17	13.34	17.01	16.7
Cd	ppm	1.6	1.1	2.6	3.5	2.2	-	-	-	0.5	0.5	3.3	< 0.5	63.5	3.8	66.9	34.4
Mn	ppm	< 3	< 3	< 3	16	16.0	1091	876	70	101	349.0	185.7	179	356	32	271	204.7
Mo	ppm	88	47	72	12	54.8	n.a.	-	-	4	4.0	87.7	48	38	21	31	45.1
Ni	ppm	< 1	2	< 1	< 1	2.0	20	4	2	72	26.0	1.0	2	< 1	9	< 1	4.0
Bi	ppm	13.9	11.9	15.8	34.9	19.1	-	-	-	-	n.a.	2.9	5.03	4.57	4.07	4.29	4.2
Ga	ppm	< 1	< 1	< 1	< 1		14	15	16	42	24.3	2.7	3	57	47	64	34.7
Ge	ppm	< 0.1	< 0.1	< 0.1	< 0.1		2	1	1	-	1.0	0.8	3.1	3.8	3	0.3	2.2
Sb	ppm	27.8	22	28.6	34.3	28.2	n.a.	1	0.9	1.6	1.2	4.7	3.3	20	23.1	20	14.2
Se	ppm	6.3	4.7	4.4	6.3	5.4	-	-	23	36	29.5	1.7	2.2	2.1	1.3	4.2	2.3
Te	ppm	3.3	2.3	1.1	0.5	1.8	n.a.	n.a.	n.a.	n.a.	n.a.	5.4	5.5	7.9	7.3	6.5	6.5
Tl	ppm	0.7	0.3	0.1	0.2	0.3	0.1	0.2	-	-	0.2	7.5	7.7	25.8	13.6	30.9	17.1

* Only mean value of the fresh dacite is provided because original data is in preparation for publication