

Supplement to:

**Experimental investigation of Apollo 16 “Rusty Rock” alteration by a lunar
fumarolic gas**

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Supplement 1: Temperature gradient in the vertical tube furnace

Table 1: Temperature gradient in the vertical tube furnace (Gero GmbH, Germany) measured with a type B thermocouple at 1 cm intervals. The thermocouple was equilibrated for 10 minutes at each step. Small temperature variations were likely due to thermal convection in the furnace.

Distance cm	Temperature		
	Min	Avrg. °C	Max
1	304	304.5	305
2	311	311.5	312
3	315	315.5	316
4	321	322	323
5	329	330	331
6	342	343	344
7	357	358	359
8	373	374	375
9	395	396.5	398
10	421	422	423
11	460	461.5	463
12	497	498.5	500
13	537	538.5	540
14	585	587	589
15	637	638.5	640
16	695	697.5	700
17	767	768.5	770
18	828	829.5	831
19	877	878.5	880
20	916	918	920
21	960	962	964
22	1001	1003	1005
23	1042	1043.5	1045
24	1079	1080	1081
25	1106	1107	1108
26	1139	1140	1141
27	1162	1163	1164
28	1187	1188	1189
29	1210	1211	1212
30	1228	1228.5	1229
31	1240	1240.5	1241
32	1251	1251	1251
33	1260	1260	1260
34	1265	1265	1265
35	1269	1269	1269
36	1272	1272	1272
37	1275	1275	1275
38	1277	1277	1277
39	1278	1278	1278
40	1280	1280	1280
41	1281	1281	1281
42	1281	1281	1281
43	1280	1280	1280
44	1278	1278	1278
45	1275	1275	1275

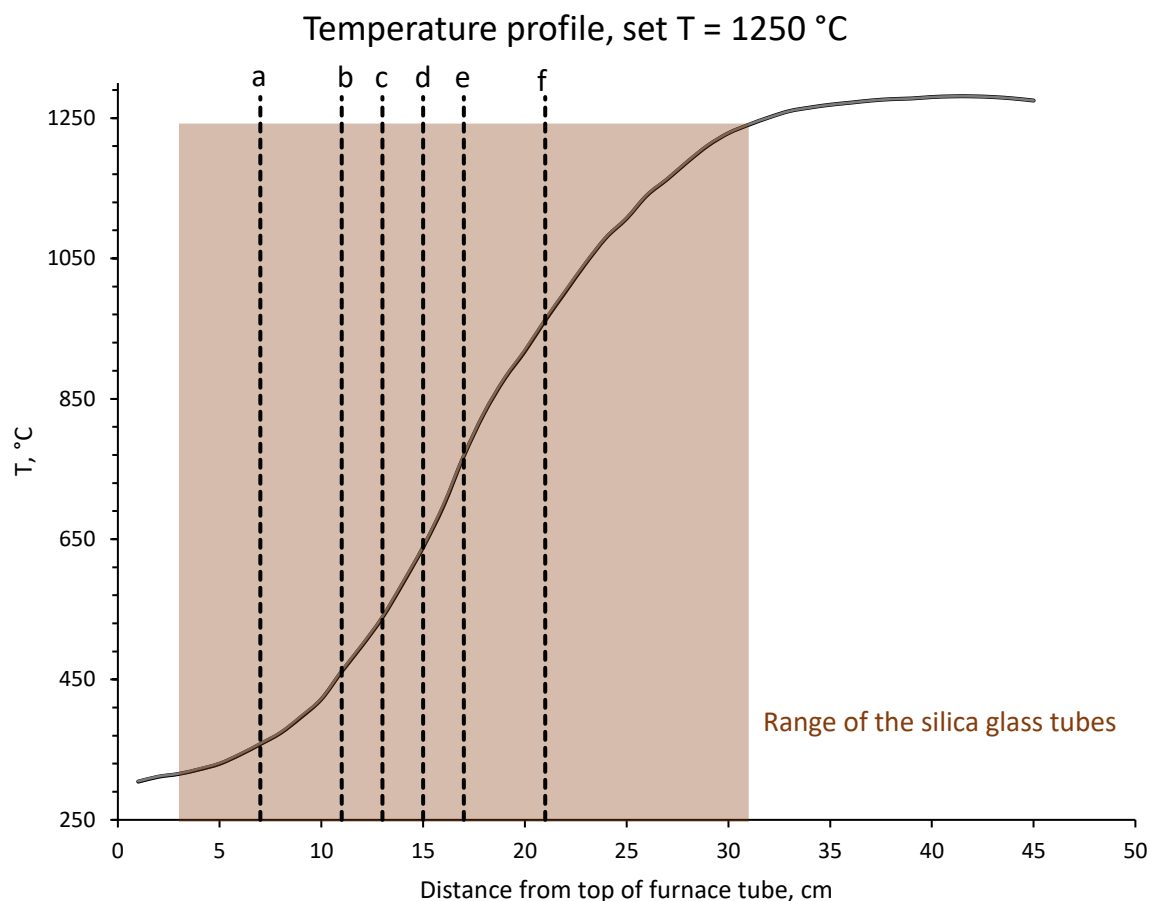


Figure 1: the solid line depicts the temperature gradient in the vertical tube furnace measured with type B thermocouple from the top of the alumina furnace tube. The colored range indicates the length and position of the evacuated silica glass tubes relative to the thermal gradient in the furnace. The stippled lines a, b, c, d, e and f indicate the positions of the Fe-metal chips placed in the silica glass tube of the metal reaction experiment. The corresponding temperatures at these positions are 396 ± 5 , 496 ± 5 , 580 ± 5 , 708 ± 5 , 825 ± 5 and 1005 ± 5 °C.

Supplement 2: Devolatilized pellets

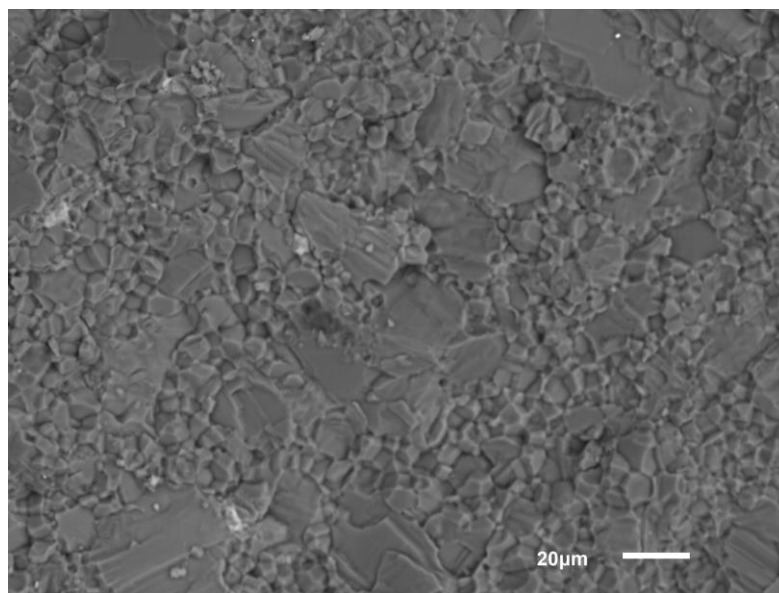


Figure 2: Back-scattered electron image of the devolatilized starting material pellet from the metal reaction experiment. The devolatilized pellet consists entirely of MgO and has lost all Zn, S and Cl to the gas phase. This suggests that the Zn-volatilization reactions $\text{ZnO} + \text{MgCl}_2 = \text{ZnCl}_{2(g)} + \text{MgO}$ or $\text{ZnO} + \text{MgCl}_2 = \text{Zn}_{(g)} + \text{Cl}_{2(g)} + \text{MgO}$ were completed, leaving only MgO.