Table S1. The values of *d* (Å), I_{rel} (%) and corresponding phase (*h*, *k*, *l*) for each peak of the XRD patterns of efflorescent minerals from Donnoe fumarole field (a, b, c) and Dachnoe thermal field (d, e, f).

***d* (Å)**	**Phase name(*h*,*k*,*l*)**	**I_{rel} (%)**	***d* (Å)**	**Phase name(*h*,*k*,*l*)**	**I_{rel} (%)**
a) Mutn-2017-2			**b) MDP-1-20-7s-a(2)**		
7.420	Gypsum(0,2,0)	89	7.179	Kaolinite(0,0,1)	87
4.420	Mascagnite(1,2,0)	16	4.878	Letovicite(1,1,-1)	14
4.232	Gypsum(1,2,-1)	100	4.468	Kaolinite(0,2,0)	34
4.001	Mascagnite(2,0,0)	5	4.345	Kaolinite(1,1,0),Tridymite(1,1,2)	100
3.752	Gypsum(0,4,0),Mascagnite(2,1,0)	10	4.159	Kaolinite(1,-1,-1),Tridymite(4,0,-4)	81
3.177	Gypsum(1,1,-2),Mascagnite(2,2,0)	3	3.958	Tridymite(3,1,-1)	16
3.037	Gypsum(1,4,-1)	88	3.842	Kaolinite(0,2,-1),Tridymite(4,0,2), Letovicite(1,0,1)	19
2.846	Gypsum(1,2,1)	31	3.733	Kaolinite(0,2,1),Tridymite(3,1,1), Letovicite(0,0,2)	43
2.818	Mascagnite(2,2,1)	4	3.571	Kaolinite(0,0,2),Letovicite(1,-2,-1)	98
2.763	Gypsum(2,1,-1),Mascagnite(1,1,2)	6	3.373	Kaolinite(1,1,1),Tridymite(4,0,-6), Letovicite(1,1,1)	11
2.663	Gypsum(0,5,1),Mascagnite(0,4,0)	22	3.173	Tridymite(4,0,4)	2
2.493	Gypsum(2,0,-2),Mascagnite(3,1,0)	3	3.063	Kaolinite(1,-1,-2),Tridymite(6,0,-2)	9
2.476	Gypsum(2,0,0)	6	2.965	Tridymite(6,0,-4),Letovicite(1,-3,0)	12
2.433	Gypsum(2,2,-2),Mascagnite(2,3,1)	4	2.752	Kaolinite(0,2,2),Letovicite(1,3,0)	6
2.207	Mascagnite(2,4,0)	16	2.551	Kaolinite(1,-3,0),Tridymite(2,0,8)	46
2.075	Gypsum(2,4,0),Mascagnite(2,4,1)	6	2.496	Kaolinite(1,1,2),Tridymite(0,2,1), Letovicite(0,0,3)	38
2.062	Gypsum(2,5,-1),Mascagnite(1,5,0)	8	2.379	Kaolinite(0,0,3),Tridymite(2,0,-10)	17
1.890	Gypsum(2,3,-3),Mascagnite(4,0,1)	8	2.337	Kaolinite(1,1,-3),Tridymite(7,1,-4)	63
1.871	Mascagnite(3,2,2)	8	2.294	Kaolinite(1,3,1),Tridymite(0,0,10)	32
1.774	Gypsum(0,3,3),Mascagnite(4,2,1)	12	2.223	Kaolinite(2,2,-1),Tridymite(5,1,5), Letovicite(0,4,1)	11
1.617	Mascagnite(2,6,0)	5	2.188	Kaolinite(2,2,0)	3
Used ICDD cards: gypsum #01-086-0943, mascagnite			1.990	Kaolinite(2,-2,1),Tridymite-M,	26
			1.944	Kaolinite(1,3,2),Tridymite-M,	9
			1.895	Kaolinite(1,4,1),Tridymite(5,1,-11), Letovicite(2,-4,-1)	21
c) MDP-1-20-4s			1.840	Kaolinite(1,0,-	12
7.640	Sulfur(1,1,1)	15	1.787	Kaolinite(0,0,4),Tridymite(6,2,3)	5
5.734	Sulfur(1,1,3)	9	1.745	Unknown	1
4.887	Sulfur(2,0,2)	6	1.659	Kaolinite(2,-4,-	46
4.269	Sulfur(1,1,5)	8	1.619	Kaolinite(1,3,3),Tridymite(8,2,2),Let	17
4.046	Sulfur(2,2,0)	21	1.585	Kaolinite(3,2,-2),Letovicite(1,3,3)	3
3.844	Sulfur(2,2,2)	100	1.543	Kaolinite(1,-1,4),Tridymite(9,1,-12)	3
3.563	Sulfur(1,3,3)	9	Used ICDD cards: kaolinite #00-060-0345, tridymite #00-018-1170, letovicite #00-042-1426		
3.446	Sulfur(0,2,6)	24			
3.337	Sulfur(2,2,4)	29			
3.207	Sulfur(0,4,0)	69	**d) DM-1-20-5s-(1)**		
3.105	Sulfur(3,1,3)	26	13.4	Alunogen(0,2,0)	11
2.844	Sulfur(0,4,4)	14	7.10	Alunogen(1,0,0)	15
2.679	Sulfur(3,3,1)	4	6.65	Alunogen(0,4,0)	2
2.620	Sulfur(1,3,7)	8	5.090	Jarosite(0,1,2),Alunogen(1,-4,0)	18
2.560	Sulfur(1,1,9)	10	4.487	Alunogen(0,4,-1)	100
2.504	Sulfur(2,4,4)	30	4.358	Tridymite(2,2,0),Alunogen(1,-3,-1)	97
2.422	Sulfur(3,1,7)	10	4.045	Cristobalite(1,0,1),Alunogen(1,2,1)	72

2.371	Sulfur(4,2,2)	9	3.913	Tridymite(2,2,2),Alunogen(1,3,1)	31
2.283	Sulfur(0,2,10)	5	3.669	Jarosite(1,1,0),Alunogen(2,0,0)	19
2.216	Sulfur(1,5,5)	4	3.343	Alunogen(1,7,0)	72
2.142	Sulfur(1,1,11)	6	3.202	Tridymite(4,2,0),Alunogen(2,-3,-1)	45
2.112	Sulfur(3,1,9)	15	3.095	Cristobalite(1,1,1),Jarosite(0,2,1), Alunogen(2,3,-1)	31
1.988	Sulfur(3,5,3)	4	2.976	Cristobalite(1,0,2),Tridymite(2,2,4), Jarosite(2,0,2),Alunogen(1,8,0)	22
1.956	Sulfur(2,6,2)	1	2.487	Cristobalite(1,1,2),Tridymite(0,4,0), Jarosite(0,2,4),Alunogen(2,-7,-1)	36
1.902	Sulfur(5,1,5)	10	2.325	Cristobalite(2,0,1),Tridymite(2,2,6), Alunogen(3,-1,-1)	10
1.834	Sulfur(3,1,11)	6	2.278	Jarosite(1,0,7),Alunogen(2,9,0)	11
1.781	Sulfur(3,5,7)	8	2.131	Tridymite(0,0,8),Alunogen(2,-10,-1)	13
1.754	Sulfur(1,7,3)	5	2.012	Cristobalite(2,0,2),Alunogen(3,0,-2)	7
1.724	Sulfur(6,0,2)	7	1.980	Cristobalite(1,1,3),Jarosite(3,0,3)	14
1.698	Sulfur(1,7,5)	3	1.923	Tridymite(8,2,0),Jarosite(0,2,7)	9
1.646	Sulfur(5,3,7)	4	1.874	Cristobalite(2,1,2)	7
1.620	Sulfur(3,7,1)	5	1.829	Cristobalite(0,0,4),Tridymite(6,2,6), Jarosite(2,2,0)	18
Used ICDD card: sulfur #01-083-2285			Used ICDD cards: alunogen #00-026-1010, jarosite #00-010-0443, tridymite #00-042-1401, cristobalite #00-039-1425		
e) Dch-2-18-4			**f) DM-1-20-3s(2)**		
13.36	Alunogen(0,2,0)	19	18.70	Copiapite(0,1,0)	6
7.18	Alunogen(1,0,0),Alum-Na(1,1,1)	30	10.53	Halotrichite(0,2,1)	5
4.90	Alunite(0,1,2),Alunogen(1,-4,0)	8	9.460	Halotrichite(0,1,2),Copiapite(0,2,0)	19
4.493	Alunogen(1,2,-1)	63	7.910	Halotrichite(0,2,2)	11
4.371	Alunogen(0,4,-1),Alum-Na(2,2,0)	91	6.410	Halotrichite(0,1,3),Copiapite(0,0,1), Melanterite(2,0,0)	9
4.048	Alunogen(1,-2,1),Alum-	100	6.050	Halotrichite(0,2,3),Copiapite(0,3,0)	23
3.909	Alunogen(1,-3,1)	34	5.542	Halotrichite(1,2,-1),Copiapite(1,-1,-1), Melanterite(1,0,-2)	7
3.592	Alunite(1,0,4),Alunogen(2,0,0),Alum-Na(3,1,1)	39	5.264	Halotrichite(0,3,3),Copiapite(1,1,-1)	6
3.348	Alunogen(1,-7,0),Alum-Na(3,1,2)	57	4.81	Halotrichite(1,1,-3),Copiapite(1,2,-1), Melanterite(1,1,1)	100
3.098	Alunogen(2,-3,-1),Alum-Na(4,0,0), Opal	18	4.59	Halotrichite(1,2,-3), Copiapite(0,3,1), Melanterite(1,0,2)	17
2.993	Alunite(0,1,5),Alunogen(1,-7,-1),Alum-Na(4,1,0)	48	4.30	Halotrichite(1,0,-4),Copiapite(1,3,0)	43
2.850	Alunite(0,0,6),Alunogen(0,8,-1),Alum-Na(3,3,1), Opal	22	4.12	Halotrichite(1,1,3)	36
2.766	Alunogen(1,-2,-2),Alum-Na(4,2,0)	4	3.96	Halotrichite(1,2,3),Copiapite(0,4,-1), Melanterite(3,0,-2)	26
2.625	Alunogen(1,-4,-2)	13	3.76	Halotrichite(0,6,2),Copiapite(0,4,1), Melanterite(3,1,-1)	27
2.545	Alunogen(2,-5,1),Alum-Na(4,2,2)	22	3.62	Halotrichite(1,5,-2),Copiapite(2,-1,0)	4
2.487	Alunite(0,2,4),Alunogen(2,-7,-1),Alum-Na(4,3,0),Opal	68	3.49	Halotrichite(1,2,4),Copiapite(2,0,-1)	71
2.334	Alunogen(2,6,1),Alum-Na(5,1,1)	38	3.34	Halotrichite(1,3,4)	3
2.282	Alunite(2,1,1),Alunogen(1,-7,-2),Alum-Na(5,2,1)	18	3.28	Halotrichite(1,6,-2),Copiapite(1,2,-2)	9
2.195	Alum-Na(4,4,0)	4	3.18	Halotrichite(1,4,-5),Copiapite(2,2,-1), Melanterite(2,1,2)	6

2.120	Alunogen(3,0,1)	6	3.05	Halotrichite(0,7,3),Copiapite(1,4,1), Melanterite(1,2,-1)	13
2.024	Alunite(0,1,8),Alunogen(3,-7,0),Alum-Na(6,1,0), Opal	16	2.97	Halotrichite(1,6,-4),Copiapite(2,-1,1)	6
1.979	Alunogen(3,0,-2),Alum-Na(6,0,2)	15	2.89	Halotrichite(0,7,4),Copiapite(1,-4,-2), Melanterite(2,2,-1)	10
1.913	Alunite(3,0,3),Alum-Na(6,1,2), Opal	15	2.83	Halotrichite(1,0,6)	9
1.869	Alum-Na(6,2,2), Opal	13	2.78	Halotrichite(2,2,-4),Copiapite(0,6,1)	10
1.827	Alum-Na(6,3,0)	18	2.72	Melanterite(2,2,1)	7
1.782	Alum-Na(4,4,4)	3	2.68	Halotrichite(1,8,-2),Copiapite(1,6,0)	8
1.672	Alum-Na(6,1,4)	17	2.61	Halotrichite(2,1,3)	6
1.616	Alum-Na(7,2,2)	9	2.56	Copiapite(1,3,2),Melanterite(4,1,-3)	8
1.540	Alum-Na(8,1,0)	16	2.46	Melanterite(1,0,4)	5
1.491	Alum-Na(8,2,0)	27	2.39	Copiapite(3,-2,0),Melanterite(3,1,-4)	7
2.195	Alum-Na(4,4,0)	4	2.29	Copiapite(0,2,3),Melanterite(4,2,-2)	16
2.120	Alunogen(3,0,1)	6	2.24	Copiapite(3,-1,-2)	5
2.024	Alunite(0,1,8),Alunogen(3,-7,0),Alum-Na(6,1,0), Opal	16	2.09	Copiapite(2,-8,-1),Melanterite(1,3,-1)	3
Used ICDD cards: alunite #00-004-0865, alunogen #00-026-1010, alum-Na #01-074-5108, opal #00-038-			Used ICDD cards: melanterite # 00-001-0255, copiapite # 00-035-0583, halotrichite # 00-039-1387		

Table S2. The chemical composition of the thermal water and gas-condensate from the Dachnoe thermal field

	Dch2/21w	Dch6/21w	Dch8/21w	Dch9/21w	Dch3/21w	Dch5/21w	Dch11/21w	Dch2/21c*
pH	2.4	2.4	2.9	2.7	6.4	4.7	3.5	5.3
	meq/l	meq/l	meq/l	meq/l	meq/l	meq/l	meq/l	meq/l
HCO_3^-	0,00	0,00	0,00	0,00	0,44	0,02	0,00	0,18
Cl^-	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
SO_4^{2-}	14,26	16,63	14,32	12,80	2,00	3,60	6,23	0,40
HSO_4^-	1,07	1,29	0,24	0,40	0,00	0,00	0,09	0,00
F	0,00	0,00	0,01	0,01	0,00	0,00	0,00	0,00
Σ A	**15,33**	**17,91**	**14,57**	**13,21**	**2,44**	**3,62**	**6,31**	**0,58**
H^+	4,62	4,74	1,16	2,06	0,00	0,00	0,36	0,00
Li^+	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Na^+	0,53	0,56	0,74	1,11	0,91	0,48	0,41	0,00
K^+	0,26	0,29	0,34	0,42	0,33	0,16	0,12	0,00
Ca^{2+}	2,75	2,98	3,33	2,87	1,25	0,50	0,31	0,20
Mg^{2+}	0,90	1,20	2,53	1,77	0,27	0,32	0,34	0,01
Fe^{3+}	3,76	0,41	0,11	1,27	0,00	0,01	0,19	0,00
Fe^{2+}	0,00	0,65	3,10	0,80	0,00	0,00	0,16	0,00
Al^{3+}	1,76	1,55	0,81	0,43	0,00	0,00	0,62	0,00
NH_4^+	1,25	5,00	2,33	2,33	0,26	1,67	3,33	0,35
Σ K	**15,83**	**17,38**	**14,47**	**13,08**	**3,01**	**3,13**	**5,84**	**0,56**

* gas condensate