

**Table 1. Hydrogen and Oxygen isotope data and calculated fluid composition**

Sample No.	Sample description	Calculate T (°C)	Mineral	Data		Fluid		<sup>40</sup> Ar- <sup>39</sup> Ar
				δ <sup>18</sup> O (VSMOW ‰)	δD (VSMOW ‰)	δ <sup>18</sup> O <sub>H2O</sub> (VSMOW ‰)	δD <sub>H2O</sub> (VSMOW ‰)	Ages (Ma) <sup>1</sup>
Biotite alteration								
4804-1224	Qz-Mol-Ccp-Py-Bio vein	400	Biotite	12.6	-75	14.7	-25	
			Quartz	8.3	-35	4.2	-35	
4804-1245	Qz-Mol-Py vein	400	Quartz	10.5	-64	6.4	-64	
4804-1234	Qz-Mol-Bio vein	400	Quartz	8.9	-62	4.8	-62	
4804-1203	Qz-Mol-Py vein	400	Quartz	9.3	-59	5.2	-59	
Qz-Mus-Py alteration								
4804-1152	Sericite altered G1 porphyry	350	Muscovite	12.6	-81	10.4	-61	
2404-737	Sericite altered G2 porphyry	350	Muscovite	7.0	-75	4.8	-55	120.9±0.8
4804-1203	Sericite halos around Qz-Mol vein	350	Muscovite	11.1	-72	8.9	-52	
1604-117	Sericite altered G3 porphyry	350	Muscovite	13.7	-82	11.5	-62	
2404-313	Mus altered G3 porphyry	350	Muscovite	7.0	-72	4.8	-52	108.7±0.7
4012-1010	Qz-Py-Ccp-Bn vein	350	Quartz	10.7	-57	5.4	-57	
4804-1223	Qz-Ccp-Py vein with filling of Kln	350	Quartz	11.2	-73	5.9	-73	
2404-903	Qz-Py-Ccp-Bn vein	350	Quartz	7.9	-83	2.6	-83	
2404-840	Qz-Py-Ccp-Bn vein replaced by Tnt	350	Quartz	7.6	-61	2.3	-61	
3212-723	Qz-Py-Ccp-Bn vein	350	Quartz	9.7	-71	4.4	-71	
1604-650	Qz-Py-Ccp vein replaced by Cv	350	Quartz	11.4	-66	6.1	-66	
2404-536	Qz-Py-Ccp vein replaced by Cv	350	Quartz	9.2	-79	3.9	-79	
2412-511	Qz-Py vein with filling of Alu	320	Quartz	10.7	-50	4.5	-50	
2404-374	Qz-Py vein replaced by Dg, with filling of Kln	320	Quartz	10.4	-81	4.2	-81	

2404-412	Qz-Py vein replaced by Dg and Bn	320	Quartz	8.8	—	2.6	—	
2405-227	Qz-Py vein replaced by Dg	320	Quartz	12.9	-64	6.7	-64	
1604-156	Qz-Py vein	320	Quartz	10.2	-70	4.0	-70	
2405-206	Qz vein with filling of Kln	320	Quartz	9.4	-84	3.2	-84	

#### Alunite

1604-429	Alu-Sul vein cemented hydrothermal breccia	250	AluniteI	8.9	-68	0.6	-60	116.3±0.8
1604-171	Laminated Alu-Sul vein	250	AluniteII	10.9	-72	2.6	-64	111.7±1.0
1604-149	Laminated Alu-Sul vein	250	AluniteII	10.5	-74	2.2	-66	
1604-375	Alu-Sul-Kln vein in Py vein	250	AluniteII	10.3	-67	2.0	-59	
4012-354	Alu-Gn-Sp vein	250	AluniteII	7.1	-79	-1.2	-71	
1604-231	Laminated Alu-Sul	250	AluniteII	-	-76	-	-68	
0804-408	Laminated Alu-Sul	250	AluniteII	9.1	-69	0.8	-61	
0804-563	Laminated Alu-Sul	250	AluniteII	8.5	-69	0.2	-61	
2412-511	Alu filling in Qz-Py vein	250	AluniteIII	11.0	-59	2.7	-51	112.5±0.8
3212-206	Alu-Sul vein with Kln-Py clasts	250	AluniteIV	10.1	-73	1.8	-65	100.6±2.0

#### Kalinite

2404-269	Kln-Sul vein	100	KaoliniteI	5.9	-96	-7.2	-72	
0804-317	Kln-Hem-Sul vein	100	KaoliniteI	14.3	-74	1.2	-51	
2404-276	Kln vein cutting Py vein	100	KaoliniteI	10.6	-96	-2.5	-72	
2405-471	Kln-Sul vein	100	KaoliniteI	3.4	-77	-9.7	-53	
2405-567	Kln-Sul vein	100	KaoliniteI	11.3	-85	-1.8	-61	
2412-282	Kln-Sul vein	100	KaoliniteI	13.4	-90	0.3	-66	
2404-92	Kln-Hem vein	100	KaoliniteI	12.9	-81	-0.2	-58	
2405-206	Kln-Hem filling in Qz vein	100	KaoliniteI	12.2	-93	-0.9	-69	
4804-1223	Barren Kln filling in Qz vein	100	KaoliniteII	16.0	-70	2.9	-47	

2412-407	Barren Kln filling in Qz vein	100	KaoliniteII	10.9	-65	-2.2	-42	
1604-429	Barren Kln filling in Alu-Sul vein	100	KaoliniteIII	7.1	-66	-6.0	-43	
1604-231	Barren Kln in Alu-Sul vein	100	KaoliniteIII	15.1	-65	2.0	-41	

$1\text{-}^{40}\text{Ar}\text{-}^{39}\text{Ar}$  ages from Yang et al., (2020 )

$\delta\text{D}_{\text{H}_2\text{O}}$  of fluid composition from quartz is from the fluid inclusions from mechanical decrepitation.

Alu-alunite, Bio-biotite, Bn-bornite, Ccp-chalcopyrite, Cv-covellite, Dic-dickite, Dg-digenite, Hem-hematite, Gp-galena, Mol-molybdenite, Mus-muscovite, Kln-kaolinite, Py-pyrite, Qz-quartz, Sp-spalerite, Sul-sulfide, Tnt-tennantite