**Supplemental Data Table 1**

Crystallographic coordinates, occupancies, equivalent isotropic (Å2) and anisotropic displacement parameters of the study micas

**Sample EJ20\_1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Atom** | **x/a** | **y/b** | **z/c** | **Occupancy** | **Uiso/equiv** | **U11** | **U22** | **U33** | **U23** | **U13** | **U12** |
| **K** | **K+** | 0 | ½ | 0 | 0.9398(5) | 0.0306 | 0.0322(2) | 0.0331(2) | 0.0264(1) | 0 | 0.0046(1) | 0 |
| **M1** | **Mg2+** | 0 | 0 | ½ | 0.8992(8) | 0.0082 | 0.0064(1) | 0.0073(1) | 0.0111(1) | 0 | 0.00201(7) | 0 |
|  | **Fe2+** | 0 | 0 | ½ | 0.1010(5) | 0.0082 | 0.0064(1) | 0.0073(1) | 0.0111(1) | 0 | 0.00201(7) | 0 |
| **M2** | **Mg2+** | 0 | 0.33131(2) | ½ | 0.9013(8) | 0.0082 | 0.00641(8) | 0.00704(8) | 0.01116(9) | 0 | 0.00193(5) | 0 |
|  | **Fe2+** | 0 | 0.33131(2) | ½ | 0.0987(6) | 0.0082 | 0.00641(8) | 0.00704(8) | 0.01116(9) | 0 | 0.00193(5) | 0 |
| **T** | **Si, Si4+** | 0.07587(2) | 0.16665(1) | 0.22726(1) | 0.9713(9) | 0.0083 | 0.00744(5) | 0.00813(5) | 0.00941(5) | 0.00002(3) | 0.00174(3) | 0.00001(3) |
| **O1** | **O, O2-** | 0.32945(8) | 0.22718(5) | 0.16969(4) | 0.9995(8) | 0.0176 | 0.0161(1) | 0.0230(2) | 0.0141(1) | -0.0027(1) | 0.0039(1) | -0.0062(1) |
| **O2** | **O, O2-** | 0.0112(1) | 0 | 0.16960(6) | 0.9997(8) | 0.0176 | 0.0243(2) | 0.0130(2) | 0.0142(2) | 0 | -0.0005(2) | 0 |
| **O3** | **O, O2-** | 0.13078(6) | 0.16660(3) | 0.39143(3) | 0.9973(8) | 0.0101 | 0.0094(1) | 0.0103(1) | 0.0108(1) | -0.00015(8) | 0.00213(8) | 0.00004(7) |
| **O4** | **O, O2-** | 0.13246(8) | ½ | 0.39915(5) | 1.0002(7) | 0.0102 | 0.0092(2) | 0.0108(2) | 0.0105(2) | 0 | 0.0017(1) | 0 |
|  | **H** | 0.12121(8) | ½ | 0.32529(5) | 0.296(1) | 0.0102 | 0.0092(2) | 0.0108(2) | 0.0105(2) | 0 | 0.0017(1) | 0 |

**Sample EJ20\_2**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Atom** | **x/a** | **y/b** | **z/c** | **Occupancy** | **Uiso/equiv** | **U11** | **U22** | **U33** | **U23** | **U13** | **U12** |
| **K** | **K+** | 0 | ½ | 0 | 0.9401(6) | 0.0312 | 0.0327(2) | 0.0334(2) | 0.0276(2) | 0 | 0.0051(2) | 0 |
| **M1** | **Mg2+** | 0 | 0 | ½ | 0.8960(8) | 0.0090 | 0.0072(2) | 0.0074(1) | 0.0126(2) | 0 | 0.0026(1) | 0 |
|  | **Fe2+** | 0 | 0 | ½ | 0.1038(5) | 0.0090 | 0.0072(2) | 0.0074(1) | 0.0126(2) | 0 | 0.0026(1) | 0 |
| **M2** | **Mg2+** | 0 | 0.33129(3) | ½ | 0.8992(8) | 0.0088 | 0.0070(1) | 0.0071(1) | 0.0126(1) | 0 | 0.00233(8) | 0 |
|  | **Fe2+** | 0 | 0.33129(3) | ½ | 0.1009(6) | 0.0088 | 0.0070(1) | 0.0071(1) | 0.0126(1) | 0 | 0.00233(8) | 0 |
| **T** | **Si, Si4+** | 0.07589(3) | 0.16666(2) | 0.22730(2) | 0.9730(9) | 0.0090 | 0.00807(7) | 0.00814(7) | 0.01097(8) | 0.00000(4) | 0.00225(5) | 0.00002(4) |
| **O1** | **O, O2-** | 0.3296(1) | 0.22708(7) | 0.16973(6) | 0.9995(8) | 0.0182 | 0.0167(2) | 0.0231(2) | 0.0156(2) | -0.0026(2) | 0.0046(2) | -0.0063(2) |
| **O2** | **O, O2-** | 0.0109(2) | 0 | 0.16969(8) | 0.9993(8) | 0.0182 | 0.0248(3) | 0.0133(3) | 0.0153(3) | 0 | 0.0002(2) | 0 |
| **O3** | **O, O2-** | 0.13059(9) | 0.16657(4) | 0.39142(5) | 0.9988(8) | 0.0107 | 0.0099(2) | 0.0097(2) | 0.0126(2) | -0.0002(1) | 0.0025(1) | 0.0001(1) |
| **O4** | **O, O2-** | 0.1325(1) | ½ | 0.39918(7) | 1.0001(7) | 0.0107 | 0.0096(2) | 0.0107(2) | 0.0119(2) | 0 | 0.0023(2) | 0 |
|  | **H** | 0.1056(1) | ½ | 0.32037(7) | 0.413(1) | 0.0107 | 0.0096(2) | 0.0107(2) | 0.0119(2) | 0 | 0.0023(2) | 0 |

**Sample EJ20\_3**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Atom** | **x/a** | **y/b** | **z/c** | **Occupancy** | **Uiso/equiv** | **U11** | **U22** | **U33** | **U23** | **U13** | **U12** |
| **K** | **K+** | 0 | ½ | 0 | 0.9463(6) | 0.0310 | 0.0323(2) | 0.0333(2) | 0.0271(2) | 0 | 0.0044(1) | 0 |
| **M1** | **Mg2+** | 0 | 0 | ½ | 0.8996(8) | 0.0082 | 0.0063(2) | 0.0069(2) | 0.0117(2) | 0 | 0.0018(1) | 0 |
|  | **Fe2+** | 0 | 0 | ½ | 0.1003(5) | 0.0082 | 0.0063(2) | 0.0069(2) | 0.0117(2) | 0 | 0.0018(1) | 0 |
| **M2** | **Mg2+** | 0 | 0.33132(2) | ½ | 0.8954(8) | 0.0084 | 0.0064(1) | 0.0070(1) | 0.0118(1) | 0 | 0.00155(8) | 0 |
|  | **Fe2+** | 0 | 0.33132(2) | ½ | 0.1045(6) | 0.0084 | 0.0064(1) | 0.0070(1) | 0.0118(1) | 0 | 0.00155(8) | 0 |
| **T** | **Si, Si4+** | 0.07591(3) | 0.16664(2) | 0.22727(2) | 0.9746(9) | 0.0086 | 0.00742(8) | 0.00809(8) | 0.01021(8) | -0.00010(4) | 0.00152(5) | 0.00000(4) |
| **O1** | **O, O2-** | 0.32958(9) | 0.22730(6) | 0.16974(5) | 0.9996(8) | 0.0177 | 0.0159(2) | 0.0228(2) | 0.0147(2) | -0.0029(2) | 0.0039(1) | -0.0061(2) |
| **O2** | **O, O2-** | 0.0111(1) | 0 | 0.16966(7) | 0.9999(8) | 0.0176 | 0.0235(3) | 0.0132(2) | 0.0147(3) | 0 | -0.0007(2) | 0 |
| **O3** | **O, O2-** | 0.13068(8) | 0.16660(4) | 0.39131(4) | 0.9988(8) | 0.0102 | 0.0094(2) | 0.0097(2) | 0.0114(2) | -0.0002(1) | 0.0018(1) | 0.0003(1) |
| **O4** | **O, O2-** | 0.1324(1) | ½ | 0.39946(6) | 1.0000(7) | 0.0102 | 0.0092(2) | 0.0110(2) | 0.0101(2) | 0 | 0.0011(2) | 0 |
|  | **H** | 0.1119(1) | ½ | 0.34101(6) | 0.922(1) | 0.0102 | 0.0092(2) | 0.0110(2) | 0.0101(2) | 0 | 0.0011(2) | 0 |

**Sample EJ25\_2**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Atom** | **x/a** | **y/b** | **z/c** | **Occupancy** | **Uiso/equiv** | **U11** | **U22** | **U33** | **U23** | **U13** | **U12** |
| **K** | **K+** | 0 | ½ | 0 | 0.9628(9) | 0.0271 | 0.0260(8) | 0.0282(8) | 0.0269(8) | 0 | 0.0035(6) | 0 |
| **M1** | **Mg2+** | 0 | 0 | ½ | 0.9701(8) | 0.0068 | 0.0023(7) | 0.0039(7) | 0.0143(9) | 0 | 0.0018(6) | 0 |
|  | **Fe2+** | 0 | 0 | ½ | 0.0299(7) | 0.0068 | 0.0023(7) | 0.0039(7) | 0.0143(9) | 0 | 0.0018(6) | 0 |
| **M2** | **Mg2+** | 0 | 0.3311(1) | ½ | 0.9548(8) | 0.0072 | 0.0029(5) | 0.0049(5) | 0.0137(6) | 0 | 0.0012(4) | 0 |
|  | **Fe2+** | 0 | 0.3311(1) | ½ | 0.0451(8) | 0.0072 | 0.0029(5) | 0.0049(5) | 0.0137(6) | 0 | 0.0012(4) | 0 |
| **T** | **Si, Si4+** | 0.0755(1) | 0.16669(7) | 0.22698(8) | 0.980(1) | 0.0070 | 0.0048(3) | 0.0062(3) | 0.0102(4) | -0.0002(3) | 0.0014(2) | -0.0003(2) |
| **O1** | **O, O2-** | 0.3309(4) | 0.2250(2) | 0.1696(2) | 1.0000(8) | 0.0166 | 0.0137(9) | 0.020(1) | 0.016(1) | -0.0024(9) | 0.0031(8) | -0.0049(8) |
| **O2** | **O, O2-** | 0.0070(6) | 0 | 0.1699(3) | 1.0001(8) | 0.0159 | 0.020(1) | 0.013(1) | 0.014(2) | 0 | -0.002(1) | 0 |
| **O3** | **O, O2-** | 0.1303(3) | 0.1668(2) | 0.3924(2) | 1.0000(8) | 0.0086 | 0.0069(8) | 0.0056(7) | 0.013(1) | 0.0006(7) | 0.0017(7) | 0.0000(6) |
| **O4** | **O, O2-** | 0.1334(4) | ½ | 0.4006(3) | 1.0009(8) | 0.0058 | 0.004(1) | 0.009(1) | 0.005(1) | 0 | 0.0004(9) | 0 |
|  | **H** | 0.1289(4) | ½ | 0.3220(3) | 0.977(1) | 0.0058 | 0.004(1) | 0.009(1) | 0.005(1) | 0 | 0.0004(9) | 0 |

**Sample EJ25\_3**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Atom** | **x/a** | **y/b** | **z/c** | **Occupancy** | **Uiso/equiv** | **U11** | **U22** | **U33** | **U23** | **U13** | **U12** |
| **K** | **K+** | 0 | ½ | 0 | 0.9601(8) | 0.0331 | 0.0321(4) | 0.0329(5) | 0.0346(4) | 0 | 0.0063(3) | 0 |
| **M1** | **Mg2+** | 0 | 0 | ½ | 0.9171(8) | 0.0128 | 0.0089(3) | 0.0102(4) | 0.0199(4) | 0 | 0.0041(3) | 0 |
|  | **Fe2+** | 0 | 0 | ½ | 0.0832(6) | 0.0128 | 0.0089(3) | 0.0102(4) | 0.0199(4) | 0 | 0.0041(3) | 0 |
| **M2** | **Mg2+** | 0 | 0.33118(7) | ½ | 0.9282(8) | 0.0123 | 0.0084(2) | 0.0098(3) | 0.0191(3) | 0 | 0.0036(2) | 0 |
|  | **Fe2+** | 0 | 0.33118(7) | ½ | 0.0718(7) | 0.0123 | 0.0084(2) | 0.0098(3) | 0.0191(3) | 0 | 0.0036(2) | 0 |
| **T** | **Si, Si4+** | 0.07581(7) | 0.16665(4) | 0.22714(4) | 0.978(1) | 0.0118 | 0.0095(2) | 0.0099(2) | 0.0163(2) | -0.0001(1) | 0.0031(1) | 0.0001(1) |
| **O1** | **O, O2-** | 0.3312(2) | 0.2255(1) | 0.1696(1) | 0.9999(8) | 0.0209 | 0.0181(4) | 0.0232(5) | 0.0224(5) | -0.0029(4) | 0.0059(4) | -0.0055(4) |
| **O2** | **O, O2-** | 0.0081(4) | 0 | 0.1696(2) | 1.0001(8) | 0.0212 | 0.0252(8) | 0.0159(7) | 0.0211(7) | 0 | 0.0002(6) | 0 |
| **O3** | **O, O2-** | 0.1307(2) | 0.1668(1) | 0.3918(1) | 0.9999(8) | 0.0136 | 0.0111(4) | 0.0114(4) | 0.0187(4) | -0.0002(3) | 0.0038(3) | 0.0005(3) |
| **O4** | **O, O2-** | 0.1328(3) | ½ | 0.4008(2) | 1.0000(7) | 0.0125 | 0.0108(5) | 0.0120(5) | 0.0148(6) | 0 | 0.0027(4) | 0 |
|  | **H** | 0.1003(3) | ½ | 0.3440(2) | 0.984(1) | 0.0125 | 0.0108(5) | 0.0120(5) | 0.0148(6) | 0 | 0.0027(4) | 0 |

**Sample EJ42\_2**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Atom** | **x/a** | **y/b** | **z/c** | **Occupancy** | **Uiso/equiv** | **U11** | **U22** | **U33** | **U23** | **U13** | **U12** |
| **K** | **K+** | 0 | ½ | 0 | 0.9824(5) | 0.0305 | 0.0339(1) | 0.0338(1) | 0.0235(1) | 0 | 0.00402(8) | 0 |
| **M1** | **Mg2+** | 0 | 0 | ½ | 0.9779(8) | 0.0083 | 0.0072(1) | 0.0069(1) | 0.0110(1) | 0 | 0.00208(8) | 0 |
|  | **Fe2+** | 0 | 0 | ½ | 0.0221(5) | 0.0083 | 0.0072(1) | 0.0069(1) | 0.0110(1) | 0 | 0.00208(8) | 0 |
| **M2** | **Mg2+** | 0 | 0.33164(2) | ½ | 0.9755(8) | 0.0085 | 0.0073(1) | 0.0070(1) | 0.0113(1) | 0 | 0.00200(6) | 0 |
|  | **Fe2+** | 0 | 0.33164(2) | ½ | 0.0248(6) | 0.0085 | 0.0073(1) | 0.0070(1) | 0.0113(1) | 0 | 0.00200(6) | 0 |
| **T** | **Si, Si4+** | 0.07618(2) | 0.16668(1) | 0.22831(1) | 0.9759(9) | 0.0085 | 0.00810(6) | 0.00787(6) | 0.00955(6) | -0.00005(2) | 0.00169(4) | 0.00001(2) |
| **O1** | **O, O2-** | 0.33082(6) | 0.22610(4) | 0.17048(3) | 0.9991(8) | 0.0175 | 0.0167(1) | 0.0224(2) | 0.0140(1) | -0.0028(1) | 0.00404(9) | -0.0060(1) |
| **O2** | **O, O2-** | 0.0088(1) | 0 | 0.17047(4) | 0.9991(8) | 0.0175 | 0.0244(2) | 0.0128(2) | 0.0140(2) | 0 | -0.0004(1) | 0 |
| **O3** | **O, O2-** | 0.13054(6) | 0.16668(3) | 0.39164(3) | 0.9989(8) | 0.0097 | 0.0094(10) | 0.0094(1) | 0.0105(1) | -0.00013(7) | 0.00183(9) | 0.00012(7) |
| **O4** | **O, O2-** | 0.13272(7) | ½ | 0.39894(4) | 1.0001(8) | 0.0100 | 0.0096(1) | 0.0099(1) | 0.0104(1) | 0 | 0.0015(1) | 0 |
|  | **H** | 0.11250(7) | ½ | 0.32092(4) | 0.392(1) | 0.0100 | 0.0096(1) | 0.0099(1) | 0.0104(1) | 0 | 0.0015(1) | 0 |

**Sample EJ42\_3**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Atom** | **x/a** | **y/b** | **z/c** | **Occupancy** | **Uiso/equiv** | **U11** | **U22** | **U33** | **U23** | **U13** | **U12** |
| **K** | **K+** | 0 | ½ | 0 | 0.9686(6) | 0.0309 | 0.0341(2) | 0.0346(2) | 0.0238(1) | 0 | 0.0042(1) | 0 |
| **M1** | **Mg2+** | 0 | 0 | ½ | 0.9225(8) | 0.0083 | 0.0068(1) | 0.0071(1) | 0.0112(1) | 0 | 0.00204(8) | 0 |
|  | **Fe2+** | 0 | 0 | ½ | 0.0774(5) | 0.0083 | 0.0068(1) | 0.0071(1) | 0.0112(1) | 0 | 0.00204(8) | 0 |
| **M2** | **Mg2+** | 0 | 0.33199(2) | ½ | 0.9238(8) | 0.0084 | 0.00658(9) | 0.00762(9) | 0.0109(1) | 0 | 0.00174(6) | 0 |
|  | **Fe2+** | 0 | 0.33199(2) | ½ | 0.0763(6) | 0.0084 | 0.00658(9) | 0.00762(9) | 0.0109(1) | 0 | 0.00174(6) | 0 |
| **T** | **Si, Si4+** | 0.07612(2) | 0.16668(1) | 0.22815(1) | 0.9767(9) | 0.0081 | 0.00729(6) | 0.00784(5) | 0.00920(6) | -0.00008(3) | 0.00163(3) | 0.00007(3) |
| **O1** | **O, O2-** | 0.32959(8) | 0.22729(5) | 0.17028(4) | 0.9996(8) | 0.0174 | 0.0163(2) | 0.0228(2) | 0.0137(1) | -0.0029(1) | 0.0040(1) | -0.0062(1) |
| **O2** | **O, O2-** | 0.0113(1) | 0 | 0.17047(5) | 0.9998(8) | 0.0174 | 0.0243(2) | 0.0132(2) | 0.0132(2) | 0 | -0.0005(2) | 0.0000 |
| **O3** | **O, O2-** | 0.13047(6) | 0.16668(3) | 0.39144(3) | 0.9992(8) | 0.0094 | 0.0090(1) | 0.0091(1) | 0.0100(1) | -0.00024(7) | 0.00175(9) | 0.00004(7) |
| **O4** | **O, O2-** | 0.13241(9) | ½ | 0.39853(5) | 1.0001(7) | 0.0098 | 0.0092(1) | 0.0100(1) | 0.0103(2) | 0 | 0.0017(1) | 0 |
|  | **H** | 0.10560(9) | ½ | 0.30556(5) | 0.431(1) | 0.0098 | 0.0092(1) | 0.0100(1) | 0.0103(2) | 0 | 0.0017(1) | 0 |

**Sample EJ42\_4**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Atom** | **x/a** | **y/b** | **z/c** | **Occupancy** | **Uiso/equiv** | **U11** | **U22** | **U33** | **U23** | **U13** | **U12** |
| **K** | **K+** | 0 | ½ | 0 | 0.9758(6) | 0.0315 | 0.0339(2) | 0.0350(2) | 0.0253(2) | 0 | 0.0043(1) | 0 |
| **M1** | **Mg2+** | 0 | 0 | ½ | 0.9465(8) | 0.0090 | 0.0069(2) | 0.0075(2) | 0.0128(2) | 0 | 0.0024(1) | 0 |
|  | **Fe2+** | 0 | 0 | ½ | 0.0534(5) | 0.0090 | 0.0069(2) | 0.0075(2) | 0.0128(2) | 0 | 0.0024(1) | 0 |
| **M2** | **Mg2+** | 0 | 0.33179(3) | ½ | 0.9486(8) | 0.0090 | 0.0067(1) | 0.0078(1) | 0.0126(1) | 0 | 0.00204(9) | 0 |
|  | **Fe2+** | 0 | 0.33179(3) | ½ | 0.0515(6) | 0.0090 | 0.0067(1) | 0.0078(1) | 0.0126(1) | 0 | 0.00204(9) | 0 |
| **T** | **Si, Si4+** | 0.07611(3) | 0.16669(2) | 0.22822(2) | 0.9815(9) | 0.0089 | 0.00774(8) | 0.00831(8) | 0.01085(8) | -0.00009(4) | 0.00194(5) | -0.00003(4) |
| **O1** | **O, O2-** | 0.3294(1) | 0.22743(6) | 0.17021(5) | 0.9996(8) | 0.0180 | 0.0163(2) | 0.0229(2) | 0.0153(2) | -0.0027(2) | 0.0044(2) | -0.0061(2) |
| **O2** | **O, O2-** | 0.0118(2) | 0 | 0.17033(7) | 1.0005(8) | 0.0181 | 0.0242(3) | 0.0138(3) | 0.0150(3) | 0 | -0.0002(2) | 0 |
| **O3** | **O, O2-** | 0.13042(8) | 0.16666(4) | 0.39134(5) | 0.9994(8) | 0.0099 | 0.0087(2) | 0.0092(2) | 0.0119(2) | -0.0002(1) | 0.0023(1) | 0.0001(1) |
| **O4** | **O, O2-** | 0.1327(1) | ½ | 0.39878(6) | 1.0000(7) | 0.0100 | 0.0088(2) | 0.0099(2) | 0.0115(2) | 0 | 0.0019(2) | 0 |
|  | **H** | 0.1053(1) | ½ | 0.31745(6) | 0.432(1) | 0.0100 | 0.0088(2) | 0.0099(2) | 0.0115(2) | 0 | 0.0019(2) | 0 |

**Sample EJ47\_2**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Atom** | **x/a** | **y/b** | **z/c** | **Occupancy** | **Uiso/equiv** | **U11** | **U22** | **U33** | **U23** | **U13** | **U12** |
| **K** | **K+** | 0 | ½ | 0 | 0.9900(4) | 0.0274 | 0.0297(1) | 0.0301(1) | 0.02233(9) | 0 | 0.00388(7) | 0 |
| **M1** | **Mg2+** | 0 | 0 | ½ | 0.9399(8) | 0.0080 | 0.0069(1) | 0.0065(1) | 0.0110(1) | 0 | 0.00255(7) | 0 |
|  | **Fe2+** | 0 | 0 | ½ | 0.0611(5) | 0.0080 | 0.0069(1) | 0.0065(1) | 0.0110(1) | 0 | 0.00255(7) | 0 |
| **M2** | **Mg2+** | 0 | 0.33221(1) | ½ | 0.9338(8) | 0.0082 | 0.00637(8) | 0.00766(9) | 0.01065(8) | 0 | 0.00161(5) | 0 |
|  | **Fe2+** | 0 | 0.33221(1) | ½ | 0.0668(5) | 0.0082 | 0.00637(8) | 0.00766(9) | 0.01065(8) | 0 | 0.00161(5) | 0 |
| **T** | **Si, Si4+** | 0.07607(2) | 0.166712(9) | 0.22798(1) | 0.9754(9) | 0.0082 | 0.00779(5) | 0.00778(5) | 0.00904(5) | -0.00005(2) | 0.00157(3) | -0.00001(2) |
| **O1** | **O, O2-** | 0.33444(6) | 0.22255(3) | 0.17091(3) | 0.9991(8) | 0.0170 | 0.0159(1) | 0.0216(1) | 0.0141(1) | -0.00335(9) | 0.00431(8) | -0.00570(9) |
| **O2** | **O, O2-** | 0.00212(9) | 0 | 0.17121(4) | 1.0021(8) | 0.0171 | 0.0234(2) | 0.0123(2) | 0.0140(2) | 0 | -0.0011(1) | 0 |
| **O3** | **O, O2-** | 0.13091(5) | 0.16686(2) | 0.39251(3) | 0.9983(8) | 0.0104 | 0.0105(1) | 0.0103(1) | 0.0103(1) | -0.00008(6) | 0.00182(8) | 0.00013(6) |
| **O4** | **O, O2-** | 0.13283(7) | ½ | 0.39989(4) | 1.0001(8) | 0.0109 | 0.0106(1) | 0.0121(1) | 0.0100(1) | 0 | 0.0015(1) | 0 |
|  | **H** | 0.10375(7) | ½ | 0.31499(4) | 0.307(1) | 0.0109 | 0.0106(1) | 0.0121(1) | 0.0100(1) | 0 | 0.0015(1) | 0 |

**Sample EJ4\_2**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Atom** | **x/a** | **y/b** | **z/c** | **Occupancy** | **Uiso/equiv** | **U11** | **U22** | **U33** | **U23** | **U13** | **U12** |
| **K** | **K+** | 0 | ½ | 0 | 0.963(3) | 0.0324 | 0.036(2) | 0.028(2) | 0.034(2) | 0 | 0.009(1) | 0 |
| **M1** | **Mg2+** | 0 | 0 | ½ | 0.984(4) | 0.0132 | 0.014(2) | 0.005(1) | 0.022(2) | 0 | 0.004(1) | 0 |
|  | **Fe2+** | 0 | 0 | ½ | 0.016(3) | 0.0132 | 0.014(2) | 0.005(1) | 0.022(2) | 0 | 0.004(1) | 0 |
| **M2** | **Mg2+** | 0 | 0.3321(2) | ½ | 0.962(4) | 0.0142 | 0.012(1) | 0.007(1) | 0.024(1) | 0 | 0.0060(9) | 0 |
|  | **Fe2+** | 0 | 0.3321(2) | ½ | 0.038(4) | 0.0142 | 0.012(1) | 0.007(9) | 0.024(1) | 0 | 0.0060(9) | 0 |
| **T** | **Si, Si4+** | 0.0750(3) | 0.1668(1) | 0.2251(2) | 0.990(8) | 0.0117 | 0.0113(7) | 0.0054(5) | 0.0186(6) | -0.0001(6) | 0.0034(5) | 0.0000(5) |
| **O1** | **O, O2-** | 0.3217(7) | 0.2344(4) | 0.1672(4) | 1.000(7) | 0.0214 | 0.024(2) | 0.019(2) | 0.023(2) | -0.000(2) | 0.008(2) | -0.004(1) |
| **O2** | **O, O2-** | 0.026(1) | 0 | 0.1674(6) | 1.000(7) | 0.0219 | 0.033(3) | 0.009(2) | 0.023(3) | 0 | 0.005(2) | 0 |
| **O3** | **O, O2-** | 0.1310(6) | 0.1670(3) | 0.3909(3) | 1.000(7) | 0.0109 | 0.011(2) | 0.003(1) | 0.019(2) | -0.000(1) | 0.004(1) | 0.001(1) |
| **O4** | **F-** | 0.1311(9) | ½ | 0.4017(4) | 1.000(1) | 0.0164 | 0.020(2) | 0.011(2) | 0.018(2) | 0 | 0.004(2) | 0 |

**Sample EJ6\_1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Atom** | **x/a** | **y/b** | **z/c** | **Occupancy** | **Uiso/equiv** | **U11** | **U22** | **U33** | **U23** | **U13** | **U12** |
| **K** | **K+** | 0 | ½ | 0 | 0.9418(9) | 0.0356 | 0.0309(8) | 0.0338(9) | 0.042(1) | 0 | 0.0050(7) | 0 |
| **M1** | **Mg2+** | 0 | 0 | ½ | 0.9887(8) | 0.0142 | 0.0084(7) | 0.0105(8) | 0.024(1) | 0 | 0.0029(7) | 0 |
|  | **Fe2+** | 0 | 0 | ½ | 0.0112(7) | 0.0142 | 0.0084(7) | 0.0105(8) | 0.024(1) | 0 | 0.0029(7) | 0 |
| **M2** | **Mg2+** | 0 | 0.3324(1) | ½ | 0.9609(8) | 0.0154 | 0.0093(5) | 0.0137(6) | 0.0233(7) | 0 | 0.0032(4) | 0 |
|  | **Fe2+** | 0 | 0.3324(1) | ½ | 0.0391(8) | 0.0154 | 0.0093(5) | 0.0137(6) | 0.0233(7) | 0 | 0.0032(4) | 0 |
| **T** | **Si, Si4+** | 0.0754(1) | 0.16661(8) | 0.22525(9) | 0.995(1) | 0.0137 | 0.0094(3) | 0.0118(3) | 0.0199(4) | 0.0001(3) | 0.0020(2) | -0.0003(2) |
| **O1** | **O, O2-** | 0.3196(4) | 0.2357(3) | 0.1667(2) | 0.9999(8) | 0.0224 | 0.0175(9) | 0.025(1) | 0.025(1) | -0.0008(9) | 0.0036(8) | -0.0063(8) |
| **O2** | **O, O2-** | 0.0269(6) | 0 | 0.1665(3) | 0.9998(8) | 0.0215 | 0.027(2) | 0.015(1) | 0.022(2) | 0 | -0.001(1) | 0 |
| **O3** | **O, O2-** | 0.1307(3) | 0.1670(2) | 0.3910(2) | 1.0002(8) | 0.0133 | 0.0080(7) | 0.0106(7) | 0.0211(9) | 0.0007(7) | 0.0018(6) | 0.0001(6) |
| **O4** | **F-** | 0.1330(4) | ½ | 0.4017(3) | 0.9998(7) | 0.0179 | 0.013(1) | 0.015(1) | 0.025(1) | 0 | 0.0035(9) | 0 |

**Sample EJ12\_3**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Atom** | **x/a** | **y/b** | **z/c** | **Occupancy** | **Uiso/equiv** | **U11** | **U22** | **U33** | **U23** | **U13** | **U12** |
| **K** | **K+** | 0 | ½ | 0 | 0.9332(1) | 0.0295 | 0.0299(4) | 0.0293(4) | 0.0294(4) | 0 | 0.0057(3) | 0 |
| **M1** | **Mg2+** | 0 | 0 | ½ | 0.9854(1) | 0.0102 | 0.0100(4) | 0.0070(4) | 0.0142(4) | 0 | 0.0039(3) | 0 |
|  | **Fe2+** | 0 | 0 | ½ | 0.0136(1) | 0.0102 | 0.0100(4) | 0.0070(4) | 0.0142(4) | 0 | 0.0039(3) | 0 |
| **M2** | **Mg2+** | 0 | 0.33224(7) | ½ | 0.9689(1) | 0.0104 | 0.0080(2) | 0.0091(3) | 0.0144(3) | 0 | 0.0026(2) | 0 |
|  | **Fe2+** | 0 | 0.33224(7) | ½ | 0.0307(1) | 0.0104 | 0.0080(2) | 0.0091(3) | 0.0144(3) | 0 | 0.0026(2) | 0 |
| **T** | **Si, Si4+** | 0.07539(7) | 0.16670(4) | 0.22528(4) | 0.9934(1) | 0.0087 | 0.0082(1) | 0.0070(2) | 0.0113(2) | 0.0002(1) | 0.0024(1) | -0.0002(1) |
| **O1** | **O, O2-** | 0.3194(2) | 0.2363(2) | 0.1667(1) | 1.0001(1) | 0.0176 | 0.0160(4) | 0.0220(5) | 0.0152(5) | -0.0007(4) | 0.0042(4) | -0.0067(4) |
| **O2** | **O, O2-** | 0.0275(4) | 0 | 0.1669(2) | 1.0005(1) | 0.0177 | 0.0260(8) | 0.0102(6) | 0.0166(7) | 0 | 0.0025(6) | 0 |
| **O3** | **O, O2-** | 0.1304(2) | 0.1669(1) | 0.3906(1) | 1.0003(1) | 0.0091 | 0.0083(3) | 0.0085(4) | 0.0108(4) | -0.0002(3) | 0.0021(3) | 0.0007(3) |
| **O4** | **F-** | 0.1331(2) | ½ | 0.4020(1) | 0.9992(1) | 0.0118 | 0.0104(5) | 0.0105(5) | 0.0143(5) | 0 | 0.0020(4) | 0 |

**Sample EJ13\_1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Atom** | **x/a** | **y/b** | **z/c** | **Occupancy** | **Uiso/equiv** | **U11** | **U22** | **U33** | **U23** | **U13** | **U12** |
| **K** | **K+** | 0 | ½ | 0 | 0.9414(1) | 0.0348 | 0.0336(4) | 0.0343(5) | 0.0364(5) | 0 | 0.0063(3) | 0 |
| **M1** | **Mg2+** | 0 | 0 | ½ | 0.9991(1) | 0.0132 | 0.0100(4) | 0.0100(4) | 0.0199(4) | 0 | 0.0035(3) | 0 |
|  | **Fe2+** | 0 | 0 | ½ | 0.0001(1) | 0.0132 | 0.0100(4) | 0.0100(4) | 0.0199(4) | 0 | 0.0035(3) | 0 |
| **M2** | **Mg2+** | 0 | 0.33238(8) | ½ | 0.9694(1) | 0.0141 | 0.0100(3) | 0.0124(3) | 0.0200(3) | 0 | 0.0031(2) | 0 |
|  | **Fe2+** | 0 | 0.33238(8) | ½ | 0.0308(1) | 0.0141 | 0.0100(3) | 0.0124(3) | 0.0200(3) | 0 | 0.0031(2) | 0 |
| **T** | **Si, Si4+** | 0.07526(7) | 0.16666(4) | 0.22509(4) | 0.9963(1) | 0.0132 | 0.0109(2) | 0.0109(2) | 0.0181(2) | -0.0002(1) | 0.0032(1) | -0.0000(1) |
| **O1** | **O, O2-** | 0.3199(2) | 0.2357(2) | 0.1666(1) | 1.0002(1) | 0.0221 | 0.0186(5) | 0.0253(6) | 0.0227(5) | -0.0015(4) | 0.0046(4) | -0.0062(4) |
| **O2** | **O, O2-** | 0.0263(4) | 0 | 0.1666(2) | 1.0001(1) | 0.0220 | 0.0274(8) | 0.0156(7) | 0.0223(7) | 0 | 0.0023(6) | 0 |
| **O3** | **O, O2-** | 0.1304(2) | 0.1667(1) | 0.3906(1) | 1.0004(1) | 0.0131 | 0.0107(4) | 0.0110(4) | 0.0178(4) | 0.0000(3) | 0.0030(3) | 0.0003(3) |
| **O4** | **F-** | 0.1332(2) | ½ | 0.4023(1) | 0.9976(1) | 0.0156 | 0.0126(5) | 0.0134(5) | 0.0210(6) | 0 | 0.0033(4) | 0 |

**Sample EJ72\_1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Atom** | **x/a** | **y/b** | **z/c** | **Occupancy** | **Uiso/equiv** | **U11** | **U22** | **U33** | **U23** | **U13** | **U12** |
| **K** | **K+** | 0 | ½ | 0 | 0.9948(6) | 0.0315 | 0.0329(2) | 0.0320(2) | 0.0295(2) | 0 | 0.0050(1) | 0 |
| **M1** | **Mg2+** | 0 | 0 | ½ | 0.8114(8) | 0.0100 | 0.0091(2) | 0.0075(2) | 0.0138(2) | 0 | 0.0032(1) | 0 |
|  | **Fe2+** | 0 | 0 | ½ | 0.1884(5) | 0.0100 | 0.0091(2) | 0.0075(2) | 0.0138(2) | 0 | 0.0032(1) | 0 |
| **M2** | **Mg2+** | 0 | 0.33462(3) | ½ | 0.8037(8) | 0.0109 | 0.0083(1) | 0.0118(1) | 0.0126(1) | 0 | 0.00172(8) | 0 |
|  | **Fe2+** | 0 | 0.33462(3) | ½ | 0.1964(6) | 0.0109 | 0.0083(1) | 0.0118(1) | 0.0126(1) | 0 | 0.00172(8) | 0 |
| **T** | **Si, Si4+** | 0.07554(3) | 0.16681(2) | 0.22679(2) | 0.9826(9) | 0.0097 | 0.00927(8) | 0.00846(8) | 0.01140(8) | -0.00013(5) | 0.00187(5) | 0.00004(5) |
| **O1** | **O, O2-** | 0.3296(1) | 0.22662(7) | 0.16935(5) | 0.9998(8) | 0.0188 | 0.0178(2) | 0.0237(3) | 0.0155(2) | -0.0030(2) | 0.0044(2) | -0.0065(2) |
| **O2** | **O, O2-** | 0.0095(2) | 0 | 0.17000(8) | 1.0002(8) | 0.0188 | 0.0262(4) | 0.0129(3) | 0.0160(3) | 0 | -0.0003(3) | 0 |
| **O3** | **O, O2-** | 0.1309(1) | 0.16735(5) | 0.39166(5) | 0.9997(8) | 0.0114 | 0.0117(2) | 0.0107(2) | 0.0117(2) | -0.0001(1) | 0.0022(1) | 0.0002(1) |
| **O4** | **O, O2-** | 0.1318(1) | ½ | 0.39890(7) | 1.0001(7) | 0.0121 | 0.0120(2) | 0.0125(3) | 0.0118(2) | 0 | 0.0021(2) | 0 |
|  | **H** | 0.1059(1) | ½ | 0.32195(7) | 0.569(1) | 0.0121 | 0.0120(2) | 0.0125(3) | 0.0118(2) | 0 | 0.0021(2) | 0 |

**Sample EJ72\_3**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Atom** | **x/a** | **y/b** | **z/c** | **Occupancy** | **Uiso/equiv** | **U11** | **U22** | **U33** | **U23** | **U13** | **U12** |
| **K** | **K+** | 0 | ½ | 0 | 0.9904(7) | 0.0338 | 0.0347(4) | 0.0333(4) | 0.0336(4) | 0 | 0.0066(3) | 0 |
| **M1** | **Mg2+** | 0 | 0 | ½ | 0.8144(8) | 0.0121 | 0.0107(3) | 0.0081(2) | 0.0183(3) | 0 | 0.0046(2) | 0 |
|  | **Fe2+** | 0 | 0 | ½ | 0.1863(6) | 0.0121 | 0.0107(3) | 0.0081(2) | 0.0183(3) | 0 | 0.0046(2) | 0 |
| **M2** | **Mg2+** | 0 | 0.33463(5) | ½ | 0.8055(8) | 0.0130 | 0.0097(2) | 0.0127(2) | 0.0169(2) | 0 | 0.0032(1) | 0 |
|  | **Fe2+** | 0 | 0.33463(5) | ½ | 0.1948(7) | 0.0130 | 0.0097(2) | 0.0127(2) | 0.0169(2) | 0 | 0.0032(1) | 0 |
| **T** | **Si, Si4+** | 0.07553(6) | 0.16682(3) | 0.22689(3) | 0.9832(9) | 0.0120 | 0.0112(1) | 0.0095(1) | 0.0156(1) | -0.0000(1) | 0.00333(9) | -0.00003(9) |
| **O1** | **O, O2-** | 0.3293(2) | 0.2270(1) | 0.1694(1) | 1.0003(8) | 0.0216 | 0.0200(4) | 0.0250(4) | 0.0206(4) | -0.0030(3) | 0.0056(3) | -0.0065(3) |
| **O2** | **O, O2-** | 0.0106(3) | 0 | 0.1700(1) | 0.9998(8) | 0.0212 | 0.0282(7) | 0.0139(5) | 0.0202(6) | 0 | 0.0009(5) | 0 |
| **O3** | **O, O2-** | 0.1307(2) | 0.16735(9) | 0.39173(9) | 0.9997(8) | 0.0134 | 0.0130(3) | 0.0114(3) | 0.0161(3) | -0.0001(3) | 0.0035(2) | 0.0000(2) |
| **O4** | **O, O2-** | 0.1319(2) | ½ | 0.3988(1) | 1.0007(8) | 0.0144 | 0.0141(5) | 0.0137(4) | 0.0156(5) | 0 | 0.0034(4) | 0 |
|  | **H** | 0.1162(2) | ½ | 0.3204(1) | 0.729(1) | 0.0144 | 0.0141(5) | 0.0137(4) | 0.0156(5) | 0 | 0.0034(4) | 0 |

**Sample EJ72\_4**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Atom** | **x/a** | **y/b** | **z/c** | **Occupancy** | **Uiso/equiv** | **U11** | **U22** | **U33** | **U23** | **U13** | **U12** |
| **K** | **K+** | 0 | ½ | 0 | 0.9953(7) | 0.0319 | 0.0318(3) | 0.0322(3) | 0.0314(3) | 0 | 0.0050(2) | 0 |
| **M1** | **Mg2+** | 0 | 0 | ½ | 0.8054(8) | 0.0099 | 0.0078(2) | 0.0071(2) | 0.0151(2) | 0 | 0.0030(1) | 0 |
|  | **Fe2+** | 0 | 0 | ½ | 0.1954(6) | 0.0099 | 0.0078(2) | 0.0071(2) | 0.0151(2) | 0 | 0.0030(1) | 0 |
| **M2** | **Mg2+** | 0 | 0.33476(4) | ½ | 0.7975(8) | 0.0107 | 0.0068(1) | 0.0116(1) | 0.0136(2) | 0 | 0.00136(9) | 0 |
|  | **Fe2+** | 0 | 0.33476(4) | ½ | 0.2028(7) | 0.0107 | 0.0068(1) | 0.0116(1) | 0.0136(2) | 0 | 0.00136(9) | 0 |
| **T** | **Si, Si4+** | 0.07541(4) | 0.16685(3) | 0.22678(3) | 0.9877(9) | 0.0097 | 0.00839(9) | 0.00818(9) | 0.0126(1) | -0.00014(8) | 0.00172(7) | -0.00013(8) |
| **O1** | **O, O2-** | 0.3289(2) | 0.2272(1) | 0.16921(8) | 0.9999(8) | 0.0189 | 0.0169(3) | 0.0234(4) | 0.0170(3) | -0.0027(3) | 0.0043(2) | -0.0062(3) |
| **O2** | **O, O2-** | 0.0106(2) | 0 | 0.1701(1) | 1.0000(8) | 0.0192 | 0.0259(5) | 0.0129(4) | 0.0173(4) | 0 | 0.0000(4) | 0 |
| **O3** | **O, O2-** | 0.1307(1) | 0.16735(7) | 0.39169(7) | 0.9999(8) | 0.0110 | 0.0099(2) | 0.0102(2) | 0.0129(2) | -0.0001(2) | 0.0021(2) | 0.0001(2) |
| **O4** | **O, O2-** | 0.1319(2) | ½ | 0.3988(1) | 1.0004(8) | 0.0120 | 0.0105(3) | 0.0124(3) | 0.0130(4) | 0 | 0.0018(3) | 0 |
|  | **H** | 0.1068(2) | ½ | 0.3205(1) | 0.530(1) | 0.0120 | 0.0105(3) | 0.0124(3) | 0.0130(4) | 0 | 0.0018(3) | 0 |

**Sample EJ72\_6**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Atom** | **x/a** | **y/b** | **z/c** | **Occupancy** | **Uiso/equiv** | **U11** | **U22** | **U33** | **U23** | **U13** | **U12** |
| **K** | **K+** | 0 | ½ | 0 | 0.9873(8) | 0.0326 | 0.0327(4) | 0.0337(4) | 0.0315(4) | 0 | 0.0059(3) | 0 |
| **M1** | **Mg2+** | 0 | 0 | ½ | 0.7941(8) | 0.0110 | 0.0088(2) | 0.0092(2) | 0.0157(3) | 0 | 0.0042(2) | 0 |
|  | **Fe2+** | 0 | 0 | ½ | 0.2060(6) | 0.0110 | 0.0088(2) | 0.0092(2) | 0.0157(3) | 0 | 0.0042(2) | 0 |
| **M2** | **Mg2+** | 0 | 0.33482(5) | ½ | 0.7900(8) | 0.0118 | 0.0076(2) | 0.0136(2) | 0.0142(2) | 0 | 0.0022(1) | 0 |
|  | **Fe2+** | 0 | 0.33482(5) | ½ | 0.2101(7) | 0.0118 | 0.0076(2) | 0.0136(2) | 0.0142(2) | 0 | 0.0022(1) | 0 |
| **T** | **Si, Si4+** | 0.07549(6) | 0.16678(3) | 0.22679(3) | 0.9842(9) | 0.0104 | 0.0086(1) | 0.0101(1) | 0.0126(1) | -0.00020(9) | 0.00252(9) | -0.00015(9) |
| **O1** | **O, O2-** | 0.3293(2) | 0.2270(1) | 0.1693(1) | 1.0000(8) | 0.0199 | 0.0172(4) | 0.0256(5) | 0.0174(4) | -0.0027(3) | 0.0049(3) | -0.0060(3) |
| **O2** | **O, O2-** | 0.0107(3) | 0 | 0.1700(1) | 1.0000(8) | 0.0199 | 0.0266(6) | 0.0151(5) | 0.0166(5) | 0 | 0.0000(4) | 0 |
| **O3** | **O, O2-** | 0.1307(2) | 0.16731(9) | 0.39171(9) | 1.0001(8) | 0.0119 | 0.0109(3) | 0.0120(3) | 0.0131(3) | 0.0001(2) | 0.0032(2) | 0.0003(2) |
| **O4** | **O, O2-** | 0.1322(2) | ½ | 0.3988(1) | 1.0005(8) | 0.0127 | 0.0114(4) | 0.0139(4) | 0.0130(4) | 0 | 0.0026(3) | 0 |
|  | **H** | 0.1126(2) | ½ | 0.3283(1) | 0.716(1) | 0.0127 | 0.0114(4) | 0.0139(4) | 0.0130(4) | 0 | 0.0026(3) | 0 |

**Supplemental Data Table 2**

Selected bond distances (Å) of the study micas

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **1631 Eruption** | | | | | | | | |
|  | **EJ20\_1** | **EJ20\_2** | **EJ20\_3** | **EJ25\_2** | **EJ25\_3** | **EJ42\_2** | **EJ42\_3** | **EJ42\_4** | **EJ47\_2** |
| **T-O1** | 1.6598(4) | 1.6596(6) | 1.6584(5) | 1.660(2) | 1.660(1) | 1.6617(3) | 1.6604(4) | 1.6605(5) | 1.6623(3) |
| **T-O1'** | 1.6597(4) | 1.6599(6) | 1.6600(5) | 1.657(2) | 1.661(1) | 1.6620(3) | 1.6611(4) | 1.6612(5) | 1.6623(3) |
| **T-O2** | 1.6597(2) | 1.6602(3) | 1.6594(3) | 1.657(1) | 1.6597(8) | 1.6622(2) | 1.6604(2) | 1.6605(3) | 1.6614(2) |
| **T-O3** | 1.6558(4) | 1.6549(5) | 1.6546(5) | 1.666(2) | 1.658(1) | 1.6528(3) | 1.6518(4) | 1.6503(5) | 1.6616(3) |
| **<T-O>** | 1.6590(7) | 1.659(1) | 1.6580(9) | 1.660(4) | 1.660(2) | 1.6600(6) | 1.6580(7) | 1.6580(9) | 1.6620(6) |
|  |  |  |  |  |  |  |  |  |  |
| **M1-O4(x2)** | 2.0466(4) | 2.0459(6) | 2.0453(6) | 2.032(2) | 2.037(1) | 2.0470(4) | 2.0503(5) | 2.0481(6) | 2.0397(4) |
| **M1-O3(x4)** | 2.0846(3) | 2.0843(4) | 2.0848(4) | 2.075(2) | 2.081(1) | 2.0839(3) | 2.0856(3) | 2.0858(4) | 2.0767(2) |
| **<M1-O>** | 2.0720(5) | 2.0720(7) | 2.0720(7) | 2.061(3) | 2.066(1) | 2.0720(5) | 2.0740(6) | 2.0730(7) | 2.0640(4) |
|  |  |  |  |  |  |  |  |  |  |
| **M2-O4(x2)** | 2.0573(3) | 2.0575(5) | 2.0551(4) | 2.049(2) | 2.047(1) | 2.0570(3) | 2.0570(3) | 2.0574(4) | 2.0439(3) |
| **M2-O3(x2)** | 2.0718(3) | 2.0717(5) | 2.0721(4) | 2.058(2) | 2.065(1) | 2.0722(3) | 2.0763(3) | 2.0755(5) | 2.0664(3) |
| **M2-O3'(x2)** | 2.0823(3) | 2.0826(5) | 2.0830(4) | 2.076(2) | 2.079(1) | 2.0838(3) | 2.0853(3) | 2.0858(5) | 2.0752(3) |
| **<M2-O>** | 2.0700(5) | 2.0710(9) | 2.0700(7) | 2.061(3) | 2.064(2) | 2.0710(5) | 2.0730(5) | 2.0730(8) | 2.0620(5) |
|  |  |  |  |  |  |  |  |  |  |
| **<M-O>** | 2.0710(7) | 2.071(1) | 2.071(1) | 2.061(4) | 2.065(2) | 2.0710(7) | 2.0730(8) | 2.073(1) | 2.0630(7) |
|  |  |  |  |  |  |  |  |  |  |
| **K-O1(x4)** | 2.9619(4) | 2.9614(6) | 2.9623(5) | 2.938(2) | 2.943(1) | 2.9587(3) | 2.9685(4) | 2.9691(5) | 2.9251(3) |
| **K-O1'(x4)** | 3.3695(5) | 3.3707(6) | 3.3689(5) | 3.379(2) | 3.380(1) | 3.3848(4) | 3.3739(5) | 3.3720(6) | 3.4127(3) |
| **K-O2 (x2)** | 2.9616(6) | 2.9598(9) | 2.9611(7) | 2.937(3) | 2.945(2) | 2.9577(5) | 2.9691(6) | 2.9705(8) | 2.9271(4) |
| **K-O2'(x2)** | 3.3686(6) | 3.3703(9) | 3.3688(8) | 3.384(3) | 3.379(2) | 3.3858(5) | 3.3752(7) | 3.3718(8) | 3.4156(5) |
| **<K-O>inner** | 2.9620(7) | 2.961(1) | 2.9620(9) | 2.938(4) | 2.944(2) | 2.9580(6) | 2.9690(7) | 2.9700(9) | 2.9260(5) |
| **<K-O>outer** | 3.3690(8) | 3.371(1) | 3.3690(9) | 3.381(4) | 3.380(2) | 3.3850(6) | 3.3740(9) | 3.372(1) | 3.4140(6) |
| **<K-O>** | 3.166(1) | 3.166(2) | 3.166(1) | 3.160(5) | 3.162(3) | 3.1720(9) | 3.172(1) | 3.171(1) | 3.1700(8) |

**Supplemental Data Table 2**

continuation

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **1872 Eruption** | | | | **1944 Eruption** | | | |
|  | **EJ4\_2** | **EJ6\_1** | **EJ12\_3** | **EJ13\_1** | **EJ72\_1** | **EJ72\_3** | **EJ72\_4** | **EJ72\_6** |
| **T-O1** | 1.644(4) | 1.651(2) | 1.646(1) | 1.647(1) | 1.6619(6) | 1.661(1) | 1.6603(8) | 1.661(1) |
| **T-O1'** | 1.649(4) | 1.646(2) | 1.647(1) | 1.648(1) | 1.6615(6) | 1.660(1) | 1.6610(8) | 1.662(1) |
| **T-O2** | 1.647(2) | 1.648(2) | 1.6468(7) | 1.6479(8) | 1.6614(3) | 1.6603(6) | 1.6600(5) | 1.6597(6) |
| **T-O3** | 1.656(4) | 1.656(2) | 1.651(1) | 1.652(1) | 1.6630(5) | 1.6633(9) | 1.6632(7) | 1.6620(9) |
| **<T-O>** | 1.649(7) | 1.650(4) | 1.648(2) | 1.649(2) | 1.662(1) | 1.661(2) | 1.661(1) | 1.661(2) |
|  |  |  |  |  |  |  |  |  |
| **M1-O4(x2)** | 2.035(4) | 2.029(2) | 2.026(1) | 2.025(1) | 2.0531(7) | 2.052(1) | 2.0517(9) | 2.051(1) |
| **M1-O3(x4)** | 2.083(3) | 2.082(2) | 2.082(1) | 2.081(1) | 2.0908(5) | 2.0892(8) | 2.0900(7) | 2.0893(8) |
| **<M1-O>** | 2.067(5) | 2.064(3) | 2.063(1) | 2.062(1) | 2.0780(9) | 2.077(1) | 2.077(1) | 2.077(1) |
|  |  |  |  |  |  |  |  |  |
| **M2-O4(x2)** | 2.027(3) | 2.029(2) | 2.028(1) | 2.026(1) | 2.0364(5) | 2.0364(9) | 2.0365(7) | 2.0358(9) |
| **M2-O3(x2)** | 2.070(4) | 2.071(2) | 2.071(1) | 2.074(1) | 2.0836(5) | 2.0831(8) | 2.0831(6) | 2.0836(9) |
| **M2-O3'(x2)** | 2.073(3) | 2.078(2) | 2.079(1) | 2.079(1) | 2.0902(5) | 2.0887(9) | 2.0903(7) | 2.0906(9) |
| **<M2-O>** | 2.057(6) | 2.059(3) | 2.059(2) | 2.060(2) | 2.0700(9) | 2.069(2) | 2.070(1) | 2.070(2) |
|  |  |  |  |  |  |  |  |  |
| **<M-O>** | 2.060(8) | 2.061(4) | 2.060(2) | 2.061(2) | 2.073(1) | 2.072(2) | 2.072(2) | 2.072(2) |
|  |  |  |  |  |  |  |  |  |
| **K-O1(x4)** | 2.998(4) | 3.007(3) | 3.011(3) | 3.006(1) | 2.9584(6) | 2.961(1) | 2.9626(9) | 2.960(1) |
| **K-O1'(x4)** | 3.278(4) | 3.264(2) | 3.258(1) | 3.263(1) | 3.3762(6) | 3.372(1) | 3.3686(9) | 3.371(1) |
| **K-O2 (x2)** | 3.001(6) | 3.007(3) | 3.009(2) | 3.002(2) | 2.9598(8) | 2.963(2) | 2.963(1) | 2.964(2) |
| **K-O2'(x2)** | 3.276(6) | 3.264(3) | 3.263(2) | 3.266(2) | 3.3826(9) | 3.376(2) | 3.379(1) | 3.377(2) |
| **<K-O>inner** | 2.999(7) | 3.007(4) | 3.010(4) | 3.005(2) | 2.959(1) | 2.962(2) | 2.963(1) | 2.961(2) |
| **<K-O>outer** | 3.277(7) | 3.264(4) | 3.260(2) | 3.264(2) | 3.378(1) | 3.373(2) | 3.372(1) | 3.373(2) |
| **<K-O>** | 3.14(1) | 3.136(6) | 3.135(4) | 3.135(3) | 3.169(1) | 3.168(3) | 3.168(2) | 3.167(3) |

**Supplemental Data Table 3**

Selected distortion parameters derived from the structure refinements of the study micas

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Eruption 1631** | | | | | | | | | |
|  | **EJ20\_1** | **EJ20\_2** | **EJ20\_3** | **EJ25\_2** | **EJ25\_3** | **EJ42\_2** | **EJ42\_3** | **EJ42\_4** | **EJ47\_2** |
| **t tet [Å]** | 2.236 | 2.235 | 2.235 | 2.243 | 2.238 | 2.237 | 2.236 | 2.236 | 2.237 |
| BLDT | 0.110 | 0.121 | 0.116 | 0.181 | 0.040 | 0.214 | 0.218 | 0.244 | 0.031 |
| **VolumeT [Å3]** | 2.341 | 2.341 | 2.338 | 2.346 | 2.346 | 2.344 | 2.339 | 2.338 | 2.355 |
| TQE | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0003 | 1.0004 | 1.0004 | 1.0004 | 1.0002 |
| TAV[°] | 1.497 | 1.452 | 1.489 | 1.211 | 1.297 | 1.783 | 1.847 | 1.988 | 0.977 |
| **τ [°]** | 110.50 | 110.48 | 110.50 | 110.37 | 110.41 | 110.61 | 110.63 | 110.68 | 110.26 |
| **α[°]** | 8.97 | 9.02 | 8.96 | 9.76 | 9.61 | 9.42 | 8.95 | 8.89 | 10.76 |
| **Δz [Å]** | -0.001 | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.002 | 0.001 | 0.003 |
| **D.M. [Å]** | 0.542 | 0.544 | 0.542 | 0.584 | 0.577 | 0.545 | 0.529 | 0.528 | 0.604 |
| **ψM(1) [°]** | 58.94 | 58.94 | 58.94 | 59.16 | 59.16 | 58.83 | 58.81 | 58.79 | 59.09 |
| **ψM(2) [°]** | 58.91 | 58.92 | 58.91 | 59.16 | 59.11 | 58.82 | 58.76 | 58.78 | 59.04 |
| **BLDM(1)** | 0.829 | 0.839 | 0.852 | 0.930 | 0.943 | 0.792 | 0.792 | 0.821 | 0.797 |
| **ELDM(1)** | 5.052 | 5.054 | 5.054 | 5.311 | 5.306 | 4.927 | 4.897 | 4.880 | 5.222 |
| **BLDM(2)** | 0.431 | 0.425 | 0.486 | 0.479 | 0.540 | 0.441 | 0.497 | 0.505 | 0.581 |
| **ELDM(2)** | 5.018 | 5.029 | 5.014 | 5.305 | 5.245 | 4.910 | 4.843 | 4.864 | 5.164 |
| **ShiftM(2) [Å]** | -0.019 | -0.019 | -0.019 | -0.020 | -0.020 | -0.016 | -0.012 | -0.014 | -0.010 |
| **Volume M(1) [Å]** | 11.663 | 11.656 | 11.657 | 11.448 | 11.546 | 11.670 | 11.727 | 11.702 | 11.527 |
| **OQEM(1)** | 1.011 | 1.011 | 1.011 | 1.013 | 1.013 | 1.011 | 1.011 | 1.011 | 1.012 |
| **OAVM(1)[°]** | 37.034 | 37.022 | 37.093 | 40.736 | 40.882 | 35.096 | 34.625 | 34.463 | 39.380 |
| **Volume M(2) [Å3]** | 11.638 | 11.638 | 11.628 | 11.446 | 11.500 | 11.658 | 11.686 | 11.691 | 11.483 |
| **OQEM(2)** | 1.011 | 1.011 | 1.0113 | 1.013 | 1.012 | 1.011 | 1.010 | 1.011 | 1.012 |
| **OAVM(2)[°]** | 37.146 | 37.310 | 37.186 | 41.500 | 40.782 | 35.431 | 34.364 | 34.779 | 38.959 |
| **euM(1)/esM(1)** | 1.106 | 1.107 | 1.107 | 1.112 | 1.112 | 1.104 | 1.103 | 1.102 | 1.110 |
| **euM(2)/esM(2)** | 1.106 | 1.106 | 1.106 | 1.112 | 1.111 | 1.103 | 1.102 | 1.102 | 1.109 |
| **t oct [Å]** | 2.138 | 2.138 | 2.138 | 2.113 | 2.119 | 2.145 | 2.149 | 2.149 | 2.121 |
| **t int [Å]** | 3.422 | 3.422 | 3.423 | 3.419 | 3.416 | 3.451 | 3.447 | 3.444 | 3.454 |
| **ΔK-O [Å]** | 0.407 | 0.410 | 0.407 | 0.443 | 0.436 | 0.427 | 0.406 | 0.403 | 0.487 |
| **t K-O4 [Å]** | 3.965 | 3.964 | 3.968 | 3.971 | 3.974 | 3.976 | 3.971 | 3.974 | 3.978 |

**Supplemental Data Table 3**

continuation

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **1872 Eruption** | | | | **1944 Eruption** | | | |
|  | **EJ4\_2** | **EJ6\_1** | **EJ12\_3** | **EJ13\_1** | **EJ72\_1** | **EJ72\_3** | **EJ72\_4** | **EJ72\_6** |
| **t tet [Å]** | 2.234 | 2.242 | 2.236 | 2.236 | 2.240 | 2.241 | 2.241 | 2.239 |
| BLDT | 0.221 | 0.188 | 0.096 | 0.093 | 0.042 | 0.062 | 0.063 | 0.042 |
| **VolumeT [Å3]** | 2.299 | 2.304 | 2.295 | 2.298 | 2.355 | 2.350 | 2.351 | 2.351 |
| TQE | 1.0004 | 1.0006 | 1.0006 | 1.0005 | 1.0002 | 1.0003 | 1.0003 | 1.0002 |
| TAV[°] | 1.641 | 2.472 | 2.362 | 2.230 | 1.090 | 1.221 | 1.200 | 1.122 |
| **τ [°]** | 110.54 | 110.49 | 110.79 | 110.75 | 110.32 | 110.38 | 110.37 | 110.33 |
| **α[°]** | 6.10 | 5.64 | 5.48 | 5.70 | 9.22 | 9.05 | 8.99 | 9.04 |
| **Δz [Å]** | 0.002 | -0.002 | 0.002 | 0.000 | 0.006 | 0.006 | 0.009 | 0.007 |
| **D.M. [Å]** | 0.508 | 0.502 | 0.495 | 0.503 | 0.555 | 0.547 | 0.548 | 0.552 |
| **ψM(1) [°]** | 58.36 | 59.31 | 59.26 | 59.30 | 59.07 | 59.03 | 59.05 | 59.06 |
| **ψM(2) [°]** | 59.19 | 59.23 | 59.19 | 59.25 | 58.93 | 58.90 | 58.92 | 58.96 |
| **BLDM(1)** | 1.026 | 1.115 | 1.208 | 1.206 | 0.805 | 0.813 | 0.827 | 0.812 |
| **ELDM(1)** | 5.540 | 5.492 | 5.427 | 5.472 | 5.205 | 5.153 | 5.177 | 5.193 |
| **BLDM(2)** | 0.973 | 0.979 | 1.003 | 1.092 | 1.073 | 1.054 | 1.091 | 1.096 |
| **ELDM(2)** | 5.337 | 5.388 | 5.342 | 5.413 | 5.039 | 5.001 | 5.025 | 5.068 |
| **ShiftM(2) [Å]** | -0.011 | -0.009 | -0.010 | -0.009 | 0.012 | 0.012 | 0.013 | 0.014 |
| **VolumeM(1) [Å]** | 11.540 | 11.491 | 11.484 | 11.458 | 11.756 | 11.741 | 11.743 | 11.727 |
| **OQEM(1)** | 1.014 | 1.014 | 1.013 | 1.0137 | 1.012 | 1.012 | 1.012 | 1.012 |
| **OAVM(1)[°]** | 44.909 | 43.954 | 43.066 | 43.893 | 39.039 | 38.221 | 38.620 | 38.862 |
| **VolumeM(2) [Å3]** | 11.384 | 11.413 | 11.421 | 11.416 | 11.626 | 11.622 | 11.625 | 11.630 |
| **OQEM(2)** | 1.013 | 1.013 | 1.013 | 1.0135 | 1.011 | 1.011 | 1.011 | 1.011 |
| **OAVM(2)[°]** | 42.466 | 43.039 | 42.566 | 43.704 | 36.898 | 36.366 | 36.692 | 37.299 |
| **euM(1)/esM(1)** | 1.117 | 1.116 | 1.115 | 1.116 | 1.110 | 1.109 | 1.109 | 1.110 |
| **euM(2)/esM(2)** | 1.113 | 1.114 | 1.113 | 1.115 | 1.106 | 1.105 | 1.106 | 1.107 |
| **t oct [Å]** | 2.107 | 2.107 | 2.110 | 2.106 | 2.136 | 2.138 | 2.137 | 2.135 |
| **t int [Å]** | 3.341 | 3.330 | 3.331 | 3.325 | 3.421 | 3.423 | 3.419 | 3.417 |
| **ΔK-O [Å]** | 0.277 | 0.257 | 0.249 | 0.259 | 0.420 | 0.411 | 0.409 | 0.412 |
| **t K-O4 [Å]** | 3.949 | 3.953 | 3.954 | 3.953 | 3.962 | 3.963 | 3.960 | 3.958 |

Notes.ttet: tetrahedral sheet thickness calculated from z coordinates of basal and apical O atoms; TQE: tetrahedral quadratic elongation (Robinson et al. 1971); TAV: tetrahedral angle variance (Robinson et al. 1971); τ: tetrahedral flattening angle; α: tetrahedral rotation angle (Hazen and Burnham 1973); Δ*z*: departure from complanarity of the basal O atoms (Güven 1971); D.M.: dimensional misfit between tetrahedral and octahedral sheets (Toraya 1981); ψ: octahedral flattening angles (Donnay et al. 1964a, 1964b); BLD: bond-length distortions (Renner and Lehmann 1986); ELD: edge-length distortion (Renner and Lehmann 1986); ShiftM(2): off-center shift of the M2 cation defined as the distance between the refined position of cation and the geometrical center of M2 site (coordinates: x/a = 0.0, y/b = 0.8333, z/c = 0.5); OQE: octahedral quadratic elongation (Robinson et al.1971); OAV: octahedral angle variance (Robinson et al. 1971); eu, es: mean lengths of unshared and shared edges, respectively (Toraya 1981); toct: octahedral sheet thickness (Toraya 1981); tint calculated from the z coordinates of basal O atoms; ΔK-O = <K-O>outer-<K-O>inner; tK-O4: projection of K-O4 distance along c\*.

Errors on distortion parameters, estimated by varying the refined positional parameters within one standard deviation are in the following ranges: < 0.5% for volumes, thicknesses, projected bond lengths, shifts; 0.1-13% for angles, bond/edge lengths distortions, sheet corrugations, D.M., ΔK-O.

**Supplemental Data Table 4**

Mean atomic numbers (electrons, e-) of cation sites, octahedral and tetrahedral mean distances (Å), as determined by structure refinements (X-ref) and chemical analyses (EPMA) of the study micas. Average error for mean atomic numbers is ± 0.5 e-

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **1631 Eruption** | | | | | | | | |
|  | **EJ20\_1** | **EJ20\_2** | **EJ20\_3** | **EJ25\_2** | **EJ25\_3** | **EJ42\_2** | **EJ42\_3** | **EJ42\_4** | **EJ47\_2** |
| **e- (M1) X-ref** | 13.42 | 13.45 | 13.40 | 12.42 | 13.17 | 12.31 | 13.08 | 12.74 | 12.87 |
| **e- (M2) X-ref** | 13.38 | 13.41 | 13.46 | 12.63 | 13.01 | 12.35 | 13.07 | 12.72 | 12.94 |
|  |  |  |  |  |  |  |  |  |  |
| **e- (M1+2M2) X-ref** | 40.18 | 40.31 | 40.32 | 37.68 | 39.19 | 37.01 | 39.22 | 38.18 | 38.75 |
| **e- (M1+2M2) EPMA** | 41.30 | 40.76 | 41.18 | 37.87 | 38.59 | 37.85 | 40.79 | 39.13 | 39.48 |
|  |  |  |  |  |  |  |  |  |  |
| **K e- X-ref** | 17.86 | 17.86 | 17.98 | 18.29 | 18.24 | 18.67 | 18.40 | 18.54 | 18.81 |
| **K e- EPMA** | 18.33 | 18.44 | 18.25 | 19.16 | 18.33 | 18.95 | 18.19 | 18.38 | 19.24 |
|  |  |  |  |  |  |  |  |  |  |
| **T e- X-ref** | 13.60 | 13.62 | 13.64 | 13.72 | 13.69 | 13.66 | 13.67 | 13.74 | 13.66 |
| **T e- EPMA** | 13.71 | 13.72 | 13.72 | 13.70 | 13.70 | 13.73 | 13.72 | 13.70 | 13.68 |
|  |  |  |  |  |  |  |  |  |  |
| **Σ+  EPMA** | 22.11 | 22.15 | 22.16 | 22.14 | 22.14 | 22.10 | 22.20 | 22.12 | 22.21 |
| **Σ-  EPMA** | 22.12 | 22.16 | 22.17 | 22.10 | 22.13 | 22.11 | 22.21 | 22.17 | 22.20 |
|  |  |  |  |  |  |  |  |  |  |
| **<M-O> X-ref** | 2.071 | 2.071 | 2.071 | 2.061 | 2.065 | 2.071 | 2.073 | 2.073 | 2.063 |
| **<M-O> EPMA** | 2.076 | 2.075 | 2.074 | 2.068 | 2.065 | 2.076 | 2.076 | 2.077 | 2.064 |
|  |  |  |  |  |  |  |  |  |  |
| **<T-O> X-ref** | 1.659 | 1.659 | 1.658 | 1.660 | 1.660 | 1.660 | 1.658 | 1.658 | 1.662 |
| **<T-O> EPMA** | 1.658 | 1.657 | 1.657 | 1.659 | 1.659 | 1.655 | 1.656 | 1.654 | 1.662 |

**Supplemental Data Table 4**

continuation

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **1872 Eruption** | | | | **1944 Eruption** | | | |
|  | **EJ4\_2** | **EJ6\_1** | **EJ12\_3** | **EJ13\_1** | **EJ72\_1** | **EJ72\_3** | **EJ72\_4** | **EJ72\_6** |
| **e- (M1) X-ref** | 12.22 | 12.16 | 12.18 | 11.99 | 14.64 | 14.62 | 14.75 | 14.89 |
| **e- (M2) X-ref** | 12.53 | 12.55 | 12.43 | 12.43 | 14.75 | 14.73 | 14.84 | 14.94 |
|  |  |  |  |  |  |  |  |  |
| **e- (M1+2M2) X-ref** | 37.28 | 37.26 | 37.04 | 36.85 | 44.14 | 44.08 | 44.43 | 44.77 |
| **e- (M1+2M2) EPMA** | 36.36 | 37.03 | 36.36 | 37.00 | 44.39 | 44.30 | 44.45 | 44.69 |
|  |  |  |  |  |  |  |  |  |
| **K e- X-ref** | 18.30 | 17.89 | 17.73 | 17.89 | 18.90 | 18.82 | 18.91 | 18.76 |
| **K e- EPMA** | 17.05 | 19.13 | 17.05 | 17.70 | 19.04 | 18.48 | 19.34 | 18.40 |
|  |  |  |  |  |  |  |  |  |
| **T e- X-ref** | 13.86 | 13.93 | 13.91 | 13.95 | 13.76 | 13.76 | 13.83 | 13.78 |
| **T e- EPMA** | 13.77 | 13.75 | 13.77 | 13.76 | 13.69 | 13.70 | 13.70 | 13.70 |
|  |  |  |  |  |  |  |  |  |
| **Σ+  EPMA** | 22.01 | 22.13 | 21.99 | 22.02 | 22.46 | 22.45 | 22.47 | 22.47 |
| **Σ-  EPMA** | 22.00 | 22.14 | 22.00 | 22.04 | 22.44 | 22.46 | 22.48 | 22.46 |
|  |  |  |  |  |  |  |  |  |
| **<M-O> X-ref** | 2.060 | 2.061 | 2.060 | 2.061 | 2.073 | 2.072 | 2.072 | 2.072 |
| **<M-O> EPMA** | 2.070 | 2.065 | 2.069 | 2.066 | 2.069 | 2.068 | 2.067 | 2.069 |
|  |  |  |  |  |  |  |  |  |
| **<T-O> X-ref** | 1.649 | 1.650 | 1.648 | 1.649 | 1.662 | 1.661 | 1.661 | 1.661 |
| **<T-O> EPMA** | 1.650 | 1.653 | 1.650 | 1.651 | 1.660 | 1.659 | 1.659 | 1.659 |

*Notes:* Σ+ and Σ- are sum of positive andnegative charges, respectively

**Supplemental Data Table 5**

Structural formulas of the study micas

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Interlayer** | **Octahedral site** | **Tetrahedral site** | **Anionic site** |
| **1631 Eruption** |  |  |  |  |
| **EJ20\_1** | **(K0.93Na0.06)Σ=0.99** | **(Mg2.49Al0.14Fe2+0.21Fe3+0.14Mn0.02)Σ=3.00** | **(Si2.84Al1.16)Σ=4.00** | **O10.12OH1.28F0.60** |
| **EJ20\_2** | **(K0.93Na0.07)Σ=1.00** | **(Mg2.51Al0.16Fe2+0.19Fe3+0.12Mn0.02)Σ=3.00** | **(Si2.87Al1.13)Σ=4.00** | **O10.16OH1.25F0.59** |
| **EJ20\_3** | **(K0.92Na0.07)Σ=0.99** | **(Mg2.48Al0.16Fe2+0.20Fe3+0.14Mn0.02)Σ=3.00** | **(Si2.87Al1.13)Σ=4.00** | **O10.17OH1.27F0.56** |
| **EJ25\_2** | **(K0.95Na0.05Ba0.01)Σ=1.01** | **(Mg2.65Al0.25Fe2+0.06Fe3+0.04Ti0.01)Σ=3.01** | **(Si2.79Al1.21)Σ=4.00** | **O10.10OH1.08F0.82** |
| **EJ25\_3** | **(K0.93Na0.06)Σ=0.99** | **(Mg2.57Al0.26Fe2+0.09Fe3+0.06Ti0.01Mn0.01)Σ=3.00** | **(Si2.81Al1.19)Σ=4.00** | **O10.13OH1.06F0.81** |
| **EJ42\_2** | **(K0.98Na0.03)Σ=1.01** | **(Mg2.76Al0.09Fe2+0.07Fe3+0.05Ti0.02)Σ=2.99** | **(Si2.93Al1.07)Σ=4.00** | **O10.11OH1.60F0.29** |
| **EJ42\_3** | **(K0.94Na0.03)Σ=0.97** | **(Mg2.50Al0.16Fe2+0.18Fe3+0.12Ti0.03Mn0.01)Σ=3.00** | **(Si2.89Al1.11)Σ=4.00** | **O10.21OH1.57F0.22** |
| **EJ42\_4** | **(K0.95Na0.03)Σ=0.98** | **(Mg2.65Al0.12Fe2+0.12Fe3+0.08Ti0.02)Σ=2.99** | **(Si2.92Al1.08)Σ=4.00** | **O10.17OH1.58F0.25** |
| **EJ47\_2** | **(K0.96Na0.04Ba0.01)Σ=1.01** | **(Mg2.42Al0.35Fe2+0.12Fe3+0.08 Ti0.02Mn0.01)Σ=3.00** | **(Si2.72Al1.28)Σ=4.00** | **O10.20OH1.57F0.23** |
|  |  |  |  |  |
| **1872 Eruption** |  |  |  |  |
| **EJ4\_2** | **(K0.88Na0.03)Σ=0.91** | **(Mg2.83Fe3+0.05Ti0.05[ ]0.07)Σ=3.00** | **(Si3.09Al0.91)Σ=4.00** | **O10.00F1.82OH0.17Cl0.01** |
| **EJ6\_1** | **(K0.96Na0.03Ba0.01)Σ=1.00** | **(Mg2.81Al0.05Fe2+0.03 Fe3+0.03Ti0.05[ ]0.02)Σ=2.99** | **(Si3.00Al1.00)Σ=4.00** | **O10.14F1.85Cl0.01** |
| **EJ12\_3** | **(K0.88Na0.03)Σ=0.91** | **(Mg2.83Fe3+0.05Ti0.05[ ]0.07)Σ=3.00** | **(Si3.07Al0.93)Σ=4.00** | **O10.00F1.94OH0.05Cl0.01** |
| **EJ13\_1** | **(K0.92Na0.02)Σ=0.94** | **(Mg2.83Fe2+0.01Fe3+0.09Ti0.02[ ]0.04)Σ=2.99** | **(Si3.05Al0.95)Σ=4.00** | **O10.04F1.95Cl0.01** |
|  |  |  |  |  |
| **1944 Eruption** |  |  |  |  |
| **EJ72\_1** | **(K0.92Na0.04Ba0.02)Σ=0.98** | **( Mg2.18Al0.19Fe2+0.28Fe3+0.19Ti0.15Cr0.01)Σ=3.00** | **(Si2.77****Al1.23)Σ=4.00** | **O10.44OH1.43F0.12Cl0.01** |
| **EJ72\_3** | **(K0.92Na0.04Ba0.01)Σ=0.97** | **(Mg2.18Al0.20Fe2+0.28Fe3+0.19Ti0.14Cr0.01)Σ=3.00** | **(Si2.79Al1.21)Σ=4.00** | **O10.46OH1.39F0.14Cl0.01** |
| **EJ72\_4** | **(K0.93Na0.05Ba0.02)Σ=1.00** | **(Mg2.16Al0.19Fe2+0.29Fe3+0.20Ti0.14Cr0.01)Σ=2.99** | **(Si2.79Al1.21)Σ=4.00** | **O10.48OH1.37F0.14Cl0.01** |
| **EJ72\_6** | **(K0.91Na0.05Ba0.01)Σ=0.97** | **(Mg2.16Al0.19Fe2+0.29Fe3+0.19Ti0.15Ni0.01Cr0.01)Σ=3.00** | **(Si2.80Al1.20)Σ=4.00** | **O10.46OH1.41F0.12Cl0.01** |