Supporting 1. The elemental composition of red samples from Maiji Mountain Grottoes by EDS analyses

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| --- | --- | --- | --- | --- |
| Sample ID | Color stratigraphy(layer no.) | Point number in BSE images | Elementary composition by SEM-EDX analyses (wt%) | possible compound |
| Fe | Pb | Hg | S | C | O | Zr | Al | Si | Na | K | Ca | Cu | P | Cl | Mg |
| MJ3 | Dark red section (2) | 1 | 43.6 | - | - | - | - | 29.0 | 6.1 | 9.2 | 9.9 | - | - | 2.0 | - | - | - | - | Red ochre |
| 2 | - | - | - | - | - | - | - | 20.7 | 67.9 | 7.8 | 2.7 | - | - | - | - | 0.7 | Silicate |
| 3 | - | - | - | - | 70.3 | 19.3 | 8.2 | 0.4 | 0.2 | 0.4 | - | 0.3 | - | - | - | 1.0 | Soot |
| MJ4 | Red section (4) | 1 | - | 85.9 | - | - | 2.5 | 5.9 | 3.9 | 0.3 | - | 0.2 | - | 0.3 | - | 0.6 | 0.4 | - | Lead white |
| 2 | 40.3 | - | - | 2.7 | 6.6 | 24.4 | - | 7.6 | 8.6 | 0.9 | 1.7 | 2.2 | - | 5.1 | - | - | Red ochre |
| 3 | - | - | - | - | - | 43.4 | 5.9 | 2.9 | 46.9 | 0.8 | - | - | - | - | - | - | Quartz |
| 4 | - | 46.9 | - | - | 37.4 | 10.3 | 4.3 | 0.2 | 0.1 | 0.2 | - | 0.1 | - | - | - | - | Soot |
| Red section (2) | 1 | - | 88.3 | - | - | - | 7.4 | 3.9 | - | - | - | - | - | - | - | - | - | Lead white |
| 2 | 38.9 | 29.4 | - | - | 1.4 | 21.7 | 3.6 | 3.1 | 0.6 | 0.2 | 0.2 | 0.6 | - | - | - | - | Red ochre |
| 3 | - | - | - | - | 2.4 | 44.0 | - | 0.4 | 49.7 | - | - | - | - | - | - | - | Quartz |
| 4 | - | 45.4 | - | 0.5 | 30.3 | 14.8 | 3.7 | 0.1 | 0.1 | 2.0 | - | 0.7 | - | 0.2 | 1.6 | - | Soot |
| 5 | - | 88.3 | - | - | - | 7.4 | 3.9 | - | - | - | - | - | - | - |  | - | Minium |
| MJ6 | Orange red section (9) | 1 | 0.6 | - | 77.0 | 11.3 | 3.0 | 5.0 | - | 1.5 | 1.2 | - | - | - | - | - | - | 0.4 | Cinnabar |
| 2 | 50.3 | - | - | - | 6.8 | 25.6 | 10.1 | 1.8 | 3.7 | - | - | - | - | - | - | 1.3 | Red ochre |
| 3 | - | - | 3.0 | - | 4.0 | 26.6 | 4.4 | 7.3 | 52.9 | - | 2.0 | - | - | - | - | - | Silicate |
| White section (8) | 4 | 2.5 | - | - | - | 14.2 | 29.3 | 10.4 | 13.3 | 22.1 | - | 4.0 | - | - | - | - | 1.5 | Silicate |
| Red section (7) | 1 | - | - | 74.3 | 12.6 | 4.0 | 5.0 | - | 1.1 | - | - | - | - | 1.7 | - | - | - | Cinnabar |
| 2 | - | 81.9 | - | - | 3.3 | 6.7 | 7.0 | 0.6 | - | - | - | - | 0.4 | - | - | - | Lead white |
| White section (6) | 3 | 0.8 | - | - | 0.1 | 18.3 | 30.4 | 9.1 | 14.8 | 23.2 | - | 2.4 | - | - | - | - | 0.4 | Silicate |
| Black section (5) |  | - | 3.4 | - | - | 55.1 | 11.7 | - | 9.5 | 13.5 | 0.4 | - | - | 2.7 | 2.3 | - | - | Soot |
| White section (4) |  | 2.0 | - | - | - | 5.1 | 31.2 | 9.2 | 20.1 | 25.8 | - | 4.2 | - | - | - | - | 0.5 | Silicate |
| Brown section (3) |  | - | 0.5 | - | - | 60.0 | 19.8 | -- | 5.2 | 7.1 | 1.0 | - | - | - | 4.4 | - | - | Soot |
| White section (2) |  | 2.2 | - | - | - | 11.6 | 33.3 | 9.6 | 5.5 | 12.2 | - | 1.5 | 14.7 | - | - | - | 6.7 | Silicate |
| MJ10 | Black section (4) | 1 | - | 67.7 | - | - | - | 14.3 | 3.9 | 1.3 | 2.4 | 1.8 | - | 1.6 | - | 3.2 | 2.6 | 1.3 | Plattnerite |
| Orange red section (3) | 2 | - | 90.8 | - | - | 1.1 | 5.6 | - | 0.2 | 0.2 | - | - | - | - | 1.1 | 0.9 | - | Minium |
| White section (2) | 3 | 3.1 | 23.1 | - | - | 4.8 | 18.2 | 7.7 | 4.7 | 15.2 | 5.8 | 2.1 | 1.6 | - | 0.3 | 9.6 | 3.6 | Silicate |

Supporting 2. The elemental composition of blue and green samples from Maiji Mountain Grottoes by EDS analyses

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sample ID | Color stratigraphy(layer no.) | Point number in BSE images | Elementary composition by SEM-EDX analyses (wt%) | possible compound |
| Na | Al | Si | S | Fe | Cu | Cl | Pb | As | Zr | O | C | Ca | P | K | Mg | Hg |
| MJ1 | Blue section (2) | 1 | 11.8 | 15.6 | 17.5 | 8.3 | 0.1 | - | - | - | - | 6.0 | 33.4 | 3.5 | 1.9 | - | 1.6 | 0.1 | - | Lazurite  |
| 2 | - | 1.0 | 0.4 | 26.7 | 42.5 | - | - | - | - | 5.3 | 13.0 | 11.2 | - | - | - | - | - | Pyrite  |
| MJ5 | Green section (7) | 1 | 0.1 | 0.2 | - | 0.1 | - | 54.7 | 27.3 | - | - | 3.7 | 12.1 | 1.2 | 0.1 | - | - | - | - | Atacamite |
| White section (6) | 2 | - | 18.7 | 23.7 | - | - | 0.9 | 0.2 | - | - | 2.9 | 30.7 | 1.5 | 10.1 | - | 9.4 | 1.3 | - | Silicate |
| Red section (5) | 3 | - | - | - | 16.4 | - | - | - | - | - | - | 5.1 | 5.1 | - | - | - | - | 73.4 | Cinnabar |
| White section (4) | 4 | - | - | - | 27.3 |  | - | - | - | - | - | 35.6 | 3.4 | 33.7 | - | - | - | - | Chalk |
| Red section (3) | 5 | - | - | - | - | - | - | - | 73.3 | 6.3 | 4.6 | 10.1 | 4.1 | 1.6 | - | - | - | - | Lead white |
| 6 | 40.0 | 12.1 | 11.6 | - | - | - | - | - | - | 7.4 | 27.5 | - | 1.3 | - | - | - | - | Red ochre |
| White section (2) | 7 | 5.9 | 12.8 | 38.7 | - | - | - | - | - | - | 8.1 | 32.5 | - | - | - | 1.9 | - | - | Silicate |
| MJ7 | Green section (5) | 1 | - | - | - | - | - | 57.8 | 17.4 | - | 1.4 | 5.8 | 17.7 | - | 0.9 | - | - | - | - | Atacamite |
| White section (4) | 2 | - | 1.1 | 4.2 | - | - | - | 0.1 | 37.1 | - | 4.7 | 7.5 | 20.0 | 24.7 | - | 0.2 | 0.4 | - | Lead white and silicate |
| Black section (3) | 3 | - | 0.8 | 0.5 | - | - | 0.7 | 0.5 | 77.7 | 2.0 | 3.0 | 6.4 | 3.4 | 3.8 | 0.9 | 0.3 | - | - | Plattnerite |
| White section (2) | 4 | - | 14.4 | 20.1 | - | - | 0.5 | - | 17.4 | - | 3.9 | 32.0 | 0.7 | 4.1 | 0.3 | 5.7 | 1.0 | - | Lead white and silicate |

Supporting 3. The elemental composition of white and black samples from Maiji Mountain Grottoes by EDS analyses

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| --- | --- | --- | --- | --- |
| Sample ID | Color stratigraphy(layer no.) | Point number in BSE images | Elementary composition by SEM-EDX analyses (wt%) | possible compound |
| K | Al | Si | Pb | C | O | Ca | Zr | P | Cl | Mg | As |
| MJ2 | White section (2)a | 1 | 15.6 | 12.5 | 38.5 | - | - | 32.0 | - | - | - | - | 1.3 | - | Potassium feldspar |
| MJ8 | Black section (3) | 1 | - | 3.6 | 6.9 | 54.3 | - | 16.6 | 9.1 | - | 6.9 | 2.5 | - | - | Plattnerite |
| White section (2) | 2 | 1.7 | 14.0 | 19.4 | 34.1 | - | 24.1 | 2.1 | 4.5 | 0.2 | - | - | - | Silicate |
| MJ9 | Transparent section (4) | 1 | - | 1.1 | 35.9 | - | 17.2 | 39.8 | - | 6.0 | - | - | - | - | Quartz and silicate |
| Black section (3) | 2 | - | 0.7 | - | 73.4 | 6.8 | 6.2 | - | 3.7 | - | 3.0 | - | 3.8 | Plattnerite |
| White section (2) | 3 | - | 1.0 | - | 61.3 | 3.4 | 8.0 | 2.1 | 5.5 | - | 1.2 | - | 16.9 | Silicate |

a The atomic percentage in this point is 46.6 % O, 10.8 % Al, 32.0 % Si, 9.3% K and 1.3% Mg and the element ratio of K, Al and Si is approximate to 1:1:3.