Table A1. Chemical composition data of the samples this study collected using LA-ICP-MS.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Type | No. | Na2O | MgO | Al2O3 | SiO2 | K2O | CaO | TiO2 | MnO | Fe2O3 |
| Ge-type ware | glaze | GT-1 | 0.49 | 0.48 | 13.99 | 74.23 | 3.78 | 5.78 | 0.04 | 0.08 | 1.09 |
| Guan ware | glaze | GW-1 | 0.57 | 1.22 | 13.17 | 64.64 | 3.11 | 12.41 | 0.02 | 0.11 | 1.27 |

Table A2. Average compositions of bodies and glazes of archaeological samples of sherds or objects dating from the Song (960-1279) and Yuan (1271-1368) Dynasties and coming from the Jiaotanxia and Laohudong kiln sites (Lahlil et al., 2013, 2015).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Previous studies | Na2O | MgO | Al2O3 | SiO2 | K2O | CaO | TiO2 | Fe2O3 | MnO |
| Songjiaotanxia Body(11) | 0.32 | 0.38 | 24.36 | 66.54 | 3.64 | 0.26 | ND | 2.94 | ND |
| Glaze (24) | 0.43 | 1.02 | 13.89 | 66.27 | 3.61 | 12.8 | 0.17 | 0.96 | 0.2 |
| Song Laohudong Body (15) | 0.43 | 0.3 | 25.37 | 66.35 | 2.98 | 0.17 | 1 | 2.61 | 0.02 |
| Glaze (132) | 0.42 | 1.02 | 13.83 | 66.91 | 3.98 | 11.69 | 0.11 | 1.09 | 0.23 |
| Yuan Laohudong Body(20) | 0.52 | 0.4 | 25.05 | 65.65 | 3.22 | 0.25 | 1.05 | 3.06 | 0.02 |
| Glaze (20) | 1.27 | 1.25 | 13.95 | 66.77 | 5.46 | 8.98 | 0.1 | 1.19 | 0.41 |
|  |  |  |  |  |  |  |  |  |  |
| Archaeological samples | Na2O | MgO | Al2O3 | SiO2 | K2O | CaO | TiO2 | Fe2O3 | MnO |
| #4 Song Jiaotanxia |  |  |  |  |  |  |  |  |  |
| Body | 0.63 | 0.54 | 24.05 | 66.37 | 3.54 | 0.27 | 0.74 | 2.88 | 0.02 |
| In-glaze | 0.38 | 0.6 | 15.36 | 67.04 | 3.58 | 10.8 | 0.08 | 1.16 | 0.13 |
| Out-glaze | 0.22 | 0.76 | 14.96 | 66.3 | 3.5 | 12.05 | 0.11 | 1.1 | 0.14 |
| #21 Song Jiaotanxia |  |  |  |  |  |  |  |  |  |
| Body | 0.65 | 0.46 | 25.94 | 64.66 | 3.07 | 0.31 | 0.87 | 3.04 | 0.01 |
| In-glaze | 0.44 | 0.47 | 12.9 | 69.11 | 4.26 | 10.85 | 0.06 | 0.91 | 0.1 |
| Out-glaze | 0.56 | 0.43 | 12.93 | 68.59 | 4.22 | 11.3 | 0.06 | 0.91 | 0.1 |
| #8 Song Laohudong |  |  |  |  |  |  |  |  |  |
| Body | 0.29 | 0 | 24.26 | 68.18 | 2.33 | 0.16 | 0.82 | 2.97 | 0.01 |
| In-glaze | 0.28 | 0.45 | 13.92 | 67.19 | 3.03 | 12.83 | 0.25 | 1.06 | 0.15 |
| Out-glaze | 0.17 | 0.71 | 14.88 | 66.16 | 3.41 | 12.53 | 0.11 | 1.04 | 0.16 |
| #14 Song Laohudong |  |  |  |  |  |  |  |  |  |
| Body | 0.46 | 0.31 | 21.86 | 69.46 | 3.73 | 0.14 | 0.7 | 2.33 | 0.01 |
| In-glaze | 0.7 | 0.64 | 13.29 | 68.84 | 4.39 | 10.02 | 0.07 | 1.06 | 0.06 |
| Out-glaze | 0.56 | 0.51 | 13.36 | 70.11 | 4.63 | 8.61 | 0.1 | 1.1 | 0.06 |
| #5 Song or Yuan FH |  |  |  |  |  |  |  |  |  |
| Body | 0.21 | 0.33 | 30.71 | 59.59 | 4.26 | 0.25 | 0.77 | 2.89 | 0.01 |
| In-glaze | 0.48 | 0.45 | 13.09 | 71.17 | 4.46 | 8.4 | 0.05 | 0.89 | 0.05 |
| Out-glaze | 0.39 | 0.33 | 12.01 | 72.54 | 4.98 | 7.71 | 0.13 | 0.9 | 0.04 |
| #6 Song or Yuan FH |  |  |  |  |  |  |  |  |  |
| Body | 0.45 | 0.15 | 20.84 | 70.2 | 4.71 | 0.16 | 0.13 | 2.37 | 0.04 |
| In-glaze | 1.02 | 0.28 | 13.12 | 70.11 | 5.23 | 7.41 | 0.31 | 1.52 | 0.13 |
| Out-glaze | 0.85 | 0.31 | 12.99 | 69.57 | 5.2 | 8.36 | 0.08 | 1.65 | 0.13 |
| #19 Yuan Laohudong |  |  |  |  |  |  |  |  |  |
| Body | 0.42 | 0.43 | 24.36 | 64.6 | 3.78 | 0.25 | 0.84 | 4.33 | 0.02 |
| In-glaze | 1.3 | 0.76 | 13.74 | 71.77 | 5.31 | 5.03 | 0.05 | 1.03 | 0.22 |
| Out-glaze | 1.23 | 0.89 | 13.79 | 71.22 | 5.17 | 5.55 | 0.06 | 1.07 | 0.21 |
|  |  |  |  |  |  |  |  |  |  |
| Model systems | Na2O | MgO | Al2O3 | SiO2 | K2O | CaO | TiO2 | Fe2O3 | MnO |
| Body | 0.34 | 0.95 | 29.13 | 59.46 | 4.34 | 0.34 | 0.45 | 4 | 0.05 |
| Song-like glaze | 1.31 | 0 | 12.52 | 70.35 | 2.83 | 11.01 | 0.02 | 1.04 | 0.03 |
| Yuan-like glaze | 2.3 | 0 | 12.33 | 73.03 | 4.83 | 5.59 | 0.02 | 1.08 | 0.03 |

Table A3. Chemical composition data of samples from Ru kiln, Zhanggongxiang kiln, Laohudong kiln, Jiaotanxia kiln, and Longquan kiln (Li et al., 2005).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Kiln | Result | Na2O | MgO | Al2O3 | SiO2 | K2O | CaO | TiO2 | MnO | Fe2O3 | Rb | Sr | Y | Zr |
| Ru kiln | average | 0.62 | 1.77 | 14.27 | 60.82 | 4.2 | 14.75 | 0.15 | 0.1 | 2.32 | 0.0119 | 0.0261 | 0.0026 | 0.0195 |
|  | s.d | 0.11 | 0.44 | 1.04 | 2.6 | 0.5 | 1.66 | 0.03 | 0.02 | 0.24 | 0.0016 | 0.0023 | 0.0002 | 0.0021 |
| Zhanggongxiang kiln | average | 0.56 | 1.71 | 12.4 | 65.59 | 4.48 | 11.63 | 0.19 | 0.06 | 2.36 | 0.0108 | 0.0299 | 0.0029 | 0.021 |
|  | s.d | 0.15 | 0.38 | 0.95 | 2.04 | 0.5 | 1.14 | 0.02 | 0.01 | 0.27 | 0.0014 | 0.002 | 0.0002 | 0.0024 |
| Laohudong-Yuan | average | 0.62 | 1.11 | 12.29 | 70.16 | 5.31 | 8.4 | 0.06 | 0.35 | 0.7 | 0.0198 | 0.027 | 0.0015 | 0.0099 |
|  | s.d | 0.08 | 0.21 | 1.47 | 3.08 | 0.49 | 1.71 | 0.04 | 0.08 | 0.35 | 0.0013 | 0.0044 | 0.0006 | 0.0027 |
| Jiaotanxian | average | 0.69 | 1.34 | 13.95 | 63.24 | 3.23 | 14.94 | 0.19 | 0.22 | 1.2 | 0.014 | 0.0635 | 0.0039 | 0.0171 |
|  | s.d | 0.13 | 0.49 | 1.1 | 1.53 | 0.44 | 1.64 | 0.06 | 0.09 | 0.28 | 0.0016 | 0.0098 | 0.001 | 0.0035 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Kiln | Result | Na2O | MgO | Al2O3 | SiO2 | K2O | CaO | TiO2 | MnO | Fe2O3 | Rb | Sr | Y | Zr |
| Juanyanchang site | average | 0.62 | 1.16 | 12.24 | 66.37 | 4.55 | 12.68 | 0.08 | 0.14 | 1.16 | 0.0186 | 0.0601 | 0.0029 | 0.0132 |
|  | s.d | 0.08 | 0.22 | 0.86 | 2.03 | 0.7 | 1.88 | 0.04 | 0.12 | 0.29 | 0.0036 | 0.0117 | 0.0011 | 0.0035 |
| Longquan | average | 0.39 | 2.14 | 12.6 | 64.57 | 4.68 | 13.26 | 0.06 | 0.1 | 1.2 | 0.032 | 0.0527 | 0.0018 | 0.0109 |
|  | s.d | 0.17 | 0.82 | 0.98 | 2.14 | 0.57 | 2.47 | 0.02 | 0.04 | 0.39 | 0.0037 | 0.0141 | 0.0013 | 0.0013 |
| Longquan | average | 0.55 | 1.48 | 13.04 | 64.42 | 4.17 | 13.73 | 0.11 | 0.1 | 1.39 | 0.0209 | 0.065 | 0.0023 | 0.013 |
|  | s.d | 0.09 | 0.35 | 1.21 | 3.16 | 0.4 | 3.08 | 0.05 | 0.04 | 0.49 | 0.0069 | 0.0166 | 0.0008 | 0.0019 |
| Jingdezhen | average | 0.56 | 0.81 | 15.3 | 72.24 | 5.64 | 3.66 | 0.04 | 0.1 | 0.65 | 0.0322 | 0.0084 | 0.0014 | 0.0125 |
|  | s.d | 0.1 | 0.22 | 1.51 | 1.39 | 0.43 | 0.46 | 0.01 | 0.02 | 0.2 | 0.0033 | 0.0015 | 0.0004 | 0.0026 |

Table A4. Chemical composition data of Heirloom Ge ware and Ge-type ware from the Ming Dynasty (1368-1644) (Duan et al., 2018).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Type | No. | Na2O | MgO | Al2O3 | SiO2 | K2O | CaO | TiO2 | MnO | Fe2O3 | Rb | Sr | Y | Zr |
| Heirloom Ge ware | 1 | 0.63 | 1.12 | 12.38 | 68.91 | 5.52 | 9.51 | 0.04 | 0.35 | 0.54 | 0.0187 | 0.0276 | 0.002 | 0.0127 |
| Heirloom Ge ware | 2 | 0.46 | 1.57 | 12.45 | 68.28 | 5.83 | 9.6 | 0.04 | 0.27 | 0.5 | 0.0203 | 0.0287 | 0.0006 | 0.0098 |
| Heirloom Ge ware | 3 | 0.52 | 1.58 | 12.95 | 65.34 | 5.49 | 11.83 | 0.05 | 0.29 | 0.95 | 0.0199 | 0.0277 | 0.0014 | 0.0108 |
| Heirloom Ge ware | 4 | 0.33 | 2.86 | 12.26 | 65.23 | 5.31 | 11.58 | 0.05 | 0.52 | 0.85 | 0.0185 | 0.0384 | 0.0015 | 0.0114 |
| Heirloom Ge ware | 5 | 0.36 | 2.23 | 12.96 | 68.7 | 5.5 | 7.96 | 0.05 | 0.39 | 0.86 | 0.0228 | 0.0283 | 0.0009 | 0.0091 |
| Heirloom Ge ware | 6 | 0.6 | 1.07 | 10.9 | 72.26 | 5.46 | 7.94 | 0.04 | 0.31 | 0.42 | 0.0187 | 0.0268 | 0.0019 | 0.0075 |
| Heirloom Ge ware | 7 | 0.51 | 1.49 | 10.66 | 72.19 | 4.81 | 8.5 | 0.04 | 0.3 | 0.5 | 0.0164 | 0.0261 | 0.0016 | 0.0069 |
| Heirloom Ge ware | 8 | 0.38 | 1.95 | 12.15 | 71.27 | 6.21 | 6.61 | 0.03 | 0.3 | 0.11 | 0.0206 | 0.0229 | 0.0021 | 0.0115 |
| Heirloom Ge ware | 9 | 0.11 | 3.61 | 11.01 | 69.67 | 5.56 | 8.2 | 0.04 | 0.33 | 0.47 | 0.0213 | 0.0229 | 0.0014 | 0.0084 |
| Heirloom Ge ware | 10 | 0.43 | 1.92 | 12.73 | 69.5 | 5.42 | 8.46 | 0.03 | 0.29 | 0.23 | 0.0178 | 0.0273 | 0.0019 | 0.0086 |
| Heirloom Ge ware | 11 | 0.41 | 2.03 | 12.51 | 68.12 | 6.05 | 8.93 | 0.05 | 0.27 | 0.63 | 0.0199 | 0.0231 | 0.0019 | 0.0102 |
| Heirloom Ge ware | 12 | 0.55 | 1.32 | 11.15 | 71.59 | 5.76 | 7.39 | 0.03 | 0.34 | 0.88 | 0.0212 | 0.0263 | 0.0014 | 0.0103 |
| Heirloom Ge ware | 13 | 0.6 | 1.28 | 13.44 | 66.28 | 6.05 | 10.14 | 0.04 | 0.46 | 0.7 | 0.0208 | 0.0289 | 0.0019 | 0.014 |
| Heirloom Ge ware | 14 | 0.5 | 1.69 | 13.27 | 66.25 | 5.65 | 10.4 | 0.04 | 0.26 | 0.94 | 0.0205 | 0.0288 | 0.0007 | 0.0088 |
| Heirloom Ge ware | 15 | 0.44 | 2.01 | 10.76 | 70.47 | 5.08 | 9.24 | 0.04 | 0.41 | 0.56 | 0.0199 | 0.0271 | 0.0016 | 0.0075 |
| Heirloom Ge ware | 16 | 0.44 | 1.84 | 11.81 | 67.73 | 6.1 | 9.69 | 0.03 | 0.68 | 0.68 | 0.02 | 0.038 | 0.0017 | 0.0118 |
| Heirloom Ge ware | 17 | 0.56 | 1.28 | 11.51 | 68.08 | 5.6 | 10.97 | 0.04 | 0.34 | 0.62 | 0.0191 | 0.0334 | 0.0017 | 0.0125 |
| Heirloom Ge ware | 18 | 0.54 | 1.4 | 11.77 | 69.67 | 5.85 | 8.42 | 0.06 | 0.39 | 0.9 | 0.0224 | 0.0266 | 0.0007 | 0.0104 |
| Heirloom Ge ware | 19 | 0.5 | 1.39 | 11.46 | 71.59 | 5.67 | 7.69 | 0.04 | 0.32 | 0.35 | 0.0195 | 0.0251 | 0.0018 | 0.0112 |
| Heirloom Ge ware | 20 | 0.5 | 1.63 | 12.71 | 67.45 | 6.21 | 9.84 | 0.04 | 0.26 | 0.36 | 0.0216 | 0.0246 | 0.0015 | 0.0118 |
| Heirloom Ge ware | 21 | 0.5 | 1.43 | 12.81 | 68.45 | 5.96 | 9.19 | 0.03 | 0.24 | 0.38 | 0.0201 | 0.0284 | 0.0017 | 0.0107 |
| Heirloom Ge ware | 22 | 0.51 | 1.41 | 11.2 | 70.9 | 5.93 | 8.3 | 0.04 | 0.33 | 0.38 | 0.0213 | 0.0264 | 0.0018 | 0.0096 |
| Heirloom Ge ware | 23 | 0.52 | 1.43 | 12.6 | 68.07 | 6.83 | 8.23 | 0.04 | 0.45 | 0.84 | 0.023 | 0.028 | 0.0015 | 0.0107 |
| Heirloom Ge ware | 24 | 0.61 | 0.99 | 11.84 | 70.23 | 5.67 | 9.03 | 0.04 | 0.29 | 0.29 | 0.0193 | 0.036 | 0.0017 | 0.0116 |
| Heirloom Ge ware | 25 | 0.62 | 0.95 | 12.58 | 71.88 | 5.49 | 6.79 | 0.03 | 0.3 | 0.34 | 0.0199 | 0.025 | 0.0019 | 0.0098 |
| Heirloom Ge ware | 26 | 0.47 | 1.73 | 12.08 | 69.54 | 5.31 | 8.78 | 0.06 | 0.34 | 0.69 | 0.0199 | 0.0277 | 0.0014 | 0.0107 |
| Heirloom Ge ware | 27 | 0.52 | 1.72 | 12.08 | 69.99 | 5.11 | 8.6 | 0.03 | 0.3 | 0.65 | 0.018 | 0.0289 | 0.0021 | 0.0097 |
| Heirloom Ge ware | 28 | 0.49 | 1.92 | 12.54 | 67.11 | 4.88 | 10.88 | 0.04 | 0.52 | 0.62 | 0.0191 | 0.0372 | 0.0019 | 0.0127 |
| Heirloom Ge ware | 29 | 0.46 | 1.84 | 12.25 | 68.06 | 5.13 | 10.14 | 0.04 | 0.27 | 0.81 | 0.0206 | 0.0296 | 0.0016 | 0.0091 |
| Heirloom Ge ware | 30 | 0.55 | 1.33 | 12.58 | 69.74 | 5.78 | 8.59 | 0.04 | 0.32 | 0.07 | 0.0188 | 0.0225 | 0.0017 | 0.0103 |
| Heirloom Ge ware | 31 | 0.58 | 0.72 | 11.03 | 74.71 | 3.77 | 6.38 | 0.08 | 0.07 | 1.66 | 0.0282 | 0.0081 | 0.0019 | 0.0066 |
| Guan ware | 1 | 0.49 | 1.41 | 11.25 | 71.79 | 5.68 | 7.43 | 0.04 | 0.3 | 0.6 | 0.0215 | 0.0233 | 0.0013 | 0.0082 |
| Guan ware | 2 | 0.31 | 2.49 | 11.41 | 70.06 | 5.47 | 8.51 | 0.04 | 0.4 | 0.33 | 0.0206 | 0.0287 | 0.0017 | 0.0087 |
| Guan ware | 3 | 0.51 | 1.55 | 12.89 | 68.9 | 4.96 | 9.1 | 0.03 | 0.32 | 0.73 | 0.0187 | 0.0271 | 0.0023 | 0.0151 |
| Ge-type (Ming) | 1 | 0.56 | 0.67 | 14.7 | 73.51 | 3.65 | 4.1 | 0.12 | 0.06 | 1.62 | 0.0309 | 0.0055 | 0.0019 | 0.0082 |
| Ge-type (Ming) | 2 | 0.59 | 0.59 | 14.25 | 74.15 | 5.36 | 3.36 | 0.03 | 0.09 | 0.58 | 0.0379 | 0.0074 | 0.0008 | 0.0063 |
| Ge-type (Ming) | 3 | 0.45 | 0.85 | 15.76 | 73.5 | 5.34 | 2.85 | 0.03 | 0.14 | 0.08 | 0.0393 | 0.0062 | 0.0016 | 0.0096 |
| Ge-type (Ming) | 4 | 0.56 | 0.5 | 16.69 | 75.56 | 3.69 | 1.32 | 0.02 | 0.07 | 0.6 | 0.0419 | 0.0065 | 0.0011 | 0.0059 |
| Ge-type (Ming) | 5 | 0.61 | 0.6 | 16.13 | 72.9 | 4.64 | 2.16 | 0.12 | 0.07 | 1.77 | 0.0411 | 0.0039 | 0.0017 | 0.0071 |
| Ge-type (Ming) | 6 | 0.58 | 0.71 | 1277 | 73.51 | 3.29 | 6.99 | 0.04 | 0.06 | 1.04 | 0.0303 | 0.0065 | 0.0014 | 0.0068 |

Table A5. Chemical composition data of Heirloom Ge ware, Laohudong ware, Longquan ware, Jingdezhen ware, Ru ware, and Ge-type ware (Li et al., 2005).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Na2O | MgO | Al2O3 | SiO2 | K2O | CaO | TiO2 | MnO | Fe2O3 | Rb | Sr | Y | Zr |
| Heirloom Ge ware | 1.36 | 1.16 | 13.37 | 68.99 | 5.36 | 7.48 | 0.09 | 0.26 | 0.92 | 0.0165 | 0.0331 | 0.0025 | 0.0078 |
| Heirloom Ge ware | 1.15 | 1.11 | 12.55 | 73.28 | 5.1 | 5.03 | 0.06 | 0.21 | 0.52 | 0.0133 | 0.0218 | 0.0014 | 0.0073 |
| Heirloom Ge ware | 2.14 | 1.07 | 12.06 | 71.57 | 4.42 | 6.99 | 0.05 | 0.2 | 0.5 | 0.0099 | 0.0175 | 0.0019 | 0.006 |
| Heirloom Ge ware | 0.86 | 1.2 | 12.85 | 71.07 | 5.55 | 5.79 | 0.07 | 0.25 | 0.7 | 0.0166 | 0.0217 | 0.0018 | 0.0074 |
| Jiaotanxia | 0.45 | 1.37 | 12.89 | 66.34 | 3.24 | 13.29 | 0.18 | 0.2 | 1.04 | 0.0143 | 0.057 | 0.0058 | 0.0221 |
| Laohudong-Song | 0.53 | 1.14 | 12.33 | 68.96 | 4.39 | 10.6 | 0.1 | 0.12 | 0.83 | 0.0168 | 0.0558 | 0.006 | 0.018 |
| Laohudong-Yuan | 1.53 | 1.3 | 14.09 | 70.13 | 4.88 | 6.08 | 0.08 | 0.27 | 0.64 | 0.0132 | 0.0182 | 0.0023 | 0.0079 |
| Longquan | 0.42 | 1.06 | 12.38 | 70.22 | 3.79 | 10.21 | 0.07 | 0.08 | 0.75 | 0.013 | 0.0392 | 0.0034 | 0.0113 |
| Longquan | 0.46 | 1.16 | 12.97 | 70.23 | 4.09 | 9.11 | 0.06 | 0.09 | 0.83 | 0.0188 | 0.0315 | 0.004 | 0.0093 |
| Jingdezhen | 2.3 | 0.41 | 13.6 | 70.43 | 3.83 | 7.25 | 0.07 | 0.07 | 1.06 | 0.0265 | 0.0117 | 0.0042 | 0.0079 |
| Ru kiln | 0.55 | 2.63 | 14.27 | 63.52 | 4.09 | 11.84 | 0.12 | 0.11 | 1.86 | 0.0118 | 0.0238 | 0.0038 | 0.0217 |
| Ge-type ware | 1.85 | 1.01 | 16.46 | 66.62 | 4.46 | 8.38 | 0.04 | 0.24 | 0.78 | N/A | N/A | N/A | N/A |
| Ge-type ware | 1.32 | 1.14 | 18.26 | 63.69 | 4.79 | 7.78 | N/A | N/A | 1.4 | N/A | N/A | N/A | N/A |
| Ge-type ware | 0.99 | 0.87 | 11.44 | 71.81 | 4.97 | 8.29 | 0.09 | 0.36 | 0.71 | N/A | N/A | N/A | N/A |
| Ge-type ware | 0.76 | 1.03 | 13.98 | 68.44 | 5.56 | 8.58 | 0.07 | 0.38 | 0.74 | N/A | N/A | N/A | N/A |

Table A6. Chemical composition data of ceramic products from Laohudong kiln site (Yan et al., 2015).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Na2O** | **MgO** | **Al2O3** | **SiO2** | **P2O5** | **K2O** | **CaO** | **TiO2** | **Fe2O3** | **MnO** | **Cr2O3** | **Rb2O** | **Y2O3** | **ZrO2** |
|  | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **%** | **ppm** | **ppm** | **ppm** | **ppm** | **ppm** |
| LHD-G01 | 0.45 | 0.65 | 14.11 | 63.44 | 0.74 | 4.42 | 14.37 | 0.23 | 1.24 | 1803 | 68 | 182 | 71 | 391 |
| LHD-G02 | 0.48 | 0.9 | 13.69 | 64.02 | 0.77 | 4.19 | 14.5 | 0.17 | 0.95 | 1620 | 86 | 163 | 67 | 334 |
| LHD-G03 | 0.34 | 0.81 | 15.87 | 60.73 | 0.83 | 5.12 | 13.62 | 0.37 | 1.87 | 2190 | 89 | 255 | 84 | 402 |
| LHD-G04 | 0.74 | 0.93 | 15.05 | 62.41 | 0.79 | 4.79 | 13.56 | 0.22 | 1.12 | 1890 | 68 | 207 | 75 | 399 |
| LHD-G05 | 0.37 | 0.6 | 12.74 | 64.98 | 0.8 | 3.88 | 14.81 | 0.18 | 1.23 | 2496 | 86 | 180 | 29 | 339 |
| LHD-G06 | 0.67 | 0.59 | 13.52 | 65.56 | 0.8 | 4.35 | 12.87 | 0.19 | 1.06 | 2336 | 69 | 166 | 26 | 365 |
| LHD-G07 | 0.54 | 0.72 | 13.97 | 67.08 | 0.71 | 4.03 | 11.55 | 0.17 | 0.87 | 2044 | 75 | 155 | 27 | 326 |
| LHD-G08 | 0.37 | 0.79 | 13.07 | 65.38 | 0.79 | 3.85 | 14.05 | 0.15 | 1.16 | 2420 | 54 | 172 | 30 | 337 |
| LHD-G09 | 0.9 | 0.69 | 16.31 | 63.83 | 0.66 | 5.29 | 10.26 | 0.27 | 1.38 | 2223 | 80 | 241 | 36 | 396 |
| LHD-G10 | 0.55 | 0.59 | 12.82 | 70.28 | 0.75 | 5.28 | 8.01 | 0.21 | 1.08 | 2339 | 94 | 236 | 29 | 417 |
| LHD-G11 | 0.41 | 0.65 | 12.93 | 65.79 | 0.89 | 4.09 | 13.32 | 0.23 | 1.25 | 2515 | 96 | 190 | 32 | 401 |
| LHD-G12 | 0.52 | 0.74 | 14.21 | 63.12 | 0.95 | 4.25 | 14.14 | 0.22 | 1.36 | 2771 | 97 | 204 | 33 | 417 |
| LHD-G13 | 0.48 | 0.71 | 14.24 | 63.63 | 0.84 | 3.93 | 14.29 | 0.19 | 1.29 | 2345 | 74 | 180 | 54 | 332 |
| LHD-G14 | 0.58 | 0.57 | 14.48 | 64.77 | 0.76 | 4.19 | 13.24 | 0.17 | 0.88 | 1974 | 75 | 160 | 52 | 333 |
| LHD-G15 | 0.32 | 0.74 | 12.85 | 65.81 | 0.76 | 3.78 | 13.97 | 0.17 | 1.26 | 1806 | 91 | 156 | 55 | 409 |
| LHD-G16 | 0.5 | 0.94 | 13.48 | 64.14 | 0.7 | 4.39 | 14.13 | 0.17 | 1.22 | 1668 | 71 | 182 | 73 | 326 |
| LHD-G17 | 0.28 | 0.86 | 13.83 | 65.11 | 0.76 | 3.82 | 13.64 | 0.17 | 1.19 | 1625 | 97 | 148 | 64 | 442 |
| LHD-G18 | 0.66 | 0.91 | 16.1 | 62.25 | 0.88 | 4.66 | 12.42 | 0.26 | 1.48 | 1869 | 105 | 215 | 80 | 405 |
| LHD-G19 | 0.52 | 0.61 | 13.85 | 66.28 | 0.65 | 4.1 | 12.5 | 0.15 | 1.02 | 1422 | 96 | 167 | 67 | 317 |
| LHD-G20 | 0.41 | 0.71 | 13.69 | 65.4 | 0.71 | 4.3 | 13.07 | 0.17 | 1.23 | 1562 | 74 | 167 | 66 | 329 |
| LHD-G21 | 0.68 | 0.92 | 14.04 | 64.21 | 0.74 | 3.96 | 13.86 | 0.17 | 1.11 | 1569 | 65 | 176 | 72 | 321 |
| LHD-G22 | 0.45 | 0.95 | 14.98 | 65.31 | 0.96 | 5.9 | 9.39 | 0.27 | 1.39 | 1937 | 101 | 242 | 82 | 493 |
| LHD-G23 | 0.59 | 0.79 | 13.35 | 66.17 | 0.86 | 3.99 | 12.56 | 0.18 | 1.16 | 1888 | 70 | 170 | 58 | 334 |
| LHD-G24 | 0.48 | 0.88 | 13.47 | 64.45 | 0.91 | 4.06 | 13.74 | 0.21 | 1.41 | 2169 | 83 | 186 | 63 | 369 |
| LHD-G25 | 0.43 | 0.87 | 13.13 | 66.04 | 0.75 | 4.27 | 12.52 | 0.18 | 1.45 | 1942 | 83 | 182 | 57 | 370 |
| LHD-G26 | 0.62 | 0.73 | 15.93 | 65.4 | 0.77 | 5.18 | 9.28 | 0.27 | 1.45 | 1648 | 106 | 228 | 72 | 439 |
| LHD-G27 | 0.59 | 0.81 | 14.26 | 64.92 | 0.85 | 4.69 | 11.59 | 0.31 | 1.57 | 1992 | 86 | 227 | 67 | 420 |
| LHD-G28 | 0.27 | 0.87 | 13.46 | 65.65 | 0.77 | 3.91 | 13.35 | 0.16 | 1.24 | 1795 | 65 | 168 | 59 | 339 |
| LHD-G29 | 0.36 | 0.77 | 12.7 | 66.22 | 0.79 | 4.14 | 13.21 | 0.21 | 1.22 | 2138 | 60 | 173 | 70 | 388 |
| LHD-G30 | 0.44 | 0.71 | 13.94 | 64.41 | 0.84 | 4.37 | 13.49 | 0.23 | 1.19 | 2009 | 86 | 184 | 60 | 390 |
| WYY-G01 | 0.37 | 0.89 | 13.08 | 67.61 | 0.85 | 4.02 | 11.71 | 0.1 | 1.06 | 1522 | 79 | 325 | 30 | 238 |
| WYY-G02 | 0.26 | 0.58 | 13.25 | 68.47 | 0.68 | 4.57 | 10.79 | 0.13 | 1.07 | 546 | 66 | 283 | 59 | 195 |
| WYY-G03 | 0.49 | 0.73 | 13.09 | 71.12 | 0.66 | 4.92 | 7.49 | 0.11 | 1.06 | 2021 | 62 | 355 | 36 | 242 |
| WYY-G04 | 0.31 | 0.66 | 13.17 | 69.97 | 0.75 | 4.61 | 9.08 | 0.08 | 1.15 | 999 | 62 | 291 | 60 | 214 |
| WYY-G05 | 0.45 | 0.56 | 13.84 | 69.32 | 0.58 | 4.91 | 8.95 | 0.08 | 1.12 | 680 | 77 | 293 | 55 | 220 |
| WYY-G06 | 0.39 | 0.69 | 16.67 | 64.44 | 0.73 | 4.73 | 10.7 | 0.1 | 1.24 | 1590 | 51 | 356 | 41 | 238 |
| WYY-G07 | 0.83 | 0.72 | 12.71 | 72.12 | 0.57 | 5.11 | 6.47 | 0.13 | 1.1 | 1039 | 69 | 323 | 64 | 196 |
| WYY-G08 | 0.48 | 0.67 | 13.69 | 70.79 | 0.54 | 4.68 | 8.14 | 0.08 | 0.73 | 638 | 78 | 330 | 22 | 226 |
| WYY-G09 | 0.61 | 0.69 | 13.6 | 68.34 | 0.76 | 4.75 | 9.88 | 0.09 | 1.06 | 671 | 61 | 337 | 36 | 219 |
| WYY-G10 | 0.34 | 0.89 | 14.27 | 68.62 | 0.57 | 4.59 | 9.34 | 0.1 | 1.06 | 887 | 74 | 322 | 21 | 223 |
| WYY-G11 | 0.52 | 0.48 | 12.92 | 70.03 | 0.55 | 4.74 | 9.43 | 0.08 | 1.05 | 648 | 79 | 289 | 49 | 209 |
| WYY-G12 | 0.28 | 0.55 | 13.65 | 66.7 | 0.76 | 4.81 | 11.91 | 0.08 | 1.04 | 693 | 85 | 312 | 53 | 221 |
| WYY-G13 | 0.36 | 0.87 | 14.07 | 65.76 | 0.94 | 4.98 | 11.93 | 0.1 | 0.73 | 1135 | 66 | 345 | 43 | 260 |
| WYY-G14 | 0.6 | 0.72 | 12.77 | 68.16 | 0.65 | 4.71 | 10.75 | 0.09 | 1.32 | 921 | 66 | 305 | 31 | 203 |
| WYY-G15 | 0.37 | 0.5 | 14.24 | 70.13 | 0.57 | 4.6 | 8.22 | 0.11 | 1.04 | 1002 | 79 | 297 | 28 | 235 |
| WYY-G16 | 0.47 | 0.87 | 13.41 | 68.31 | 0.77 | 4.31 | 10.38 | 0.09 | 1.15 | 974 | 64 | 289 | 62 | 228 |
| WYY-G17 | 0.55 | 0.64 | 14.53 | 66.97 | 0.68 | 5.05 | 10.11 | 0.1 | 1.04 | 1768 | 66 | 355 | 43 | 242 |
| WYY-G18 | 0.49 | 0.55 | 13.4 | 69.22 | 0.77 | 4.64 | 9.59 | 0.08 | 0.99 | 1157 | 64 | 343 | 40 | 237 |
| WYY-G19 | 0.5 | 0.67 | 13.85 | 68.32 | 0.74 | 5 | 9.36 | 0.1 | 1.18 | 1377 | 80 | 357 | 43 | 230 |
| WYY-G20 | 0.31 | 0.68 | 13.85 | 68.6 | 0.71 | 5.22 | 9.15 | 0.19 | 0.97 | 1665 | 67 | 371 | 49 | 231 |
| WYY-G21 | 0.67 | 0.75 | 13.58 | 69.53 | 0.62 | 4.91 | 8.63 | 0.11 | 0.96 | 1158 | 71 | 322 | 40 | 219 |
| WYY-G22 | 0.51 | 0.5 | 14.02 | 69.13 | 0.66 | 4.87 | 9.05 | 0.09 | 0.91 | 1159 | 74 | 319 | 30 | 232 |
| XMT-G01 | 0.37 | 0.61 | 16.24 | 63.81 | 0.79 | 3.66 | 12.61 | 0.19 | 1.47 | 982 | 73 | 152 | 41 | 340 |
| XMT-G02 | 0.94 | 0.86 | 14.97 | 63.48 | 0.8 | 4.42 | 13.23 | 0.12 | 0.9 | 1184 | 65 | 200 | 40 | 260 |
| XMT-G03 | 0.52 | 0.8 | 14.66 | 64.02 | 0.79 | 4.45 | 13.14 | 0.16 | 1.18 | 1292 | 67 | 181 | 41 | 269 |
| XMT-G04 | 0.38 | 0.62 | 15.6 | 63.31 | 0.76 | 4.22 | 13.07 | 0.22 | 1.55 | 1277 | 75 | 199 | 38 | 272 |
| XMT-G05 | 0.36 | 0.65 | 16.22 | 63.59 | 0.75 | 4.22 | 11.62 | 0.28 | 2.03 | 1140 | 78 | 169 | 35 | 311 |
| XMT-G06 | 0.42 | 0.5 | 10.62 | 72.68 | 0.63 | 4.89 | 9.14 | 0.1 | 0.8 | 905 | 72 | 206 | 31 | 232 |
| XMT-G07 | 0.33 | 0.6 | 13.88 | 66.87 | 0.74 | 4.22 | 11.22 | 0.13 | 1.78 | 927 | 71 | 181 | 37 | 286 |
| XMT-G08 | 0.7 | 0.74 | 13.58 | 66 | 0.85 | 4.01 | 12.74 | 0.1 | 1.03 | 1340 | 60 | 190 | 31 | 239 |
| XMT-G09 | 0.38 | 0.94 | 13.9 | 65.81 | 0.83 | 4.89 | 11.61 | 0.18 | 1.06 | 2416 | 78 | 175 | 43 | 266 |
| XMT-G10 | 0.43 | 0.58 | 15.22 | 65.73 | 0.68 | 3.57 | 12.3 | 0.13 | 1.15 | 839 | 72 | 129 | 27 | 265 |
| XMT-G11 | 0.69 | 0.74 | 13.94 | 65.02 | 0.87 | 4.99 | 12.6 | 0.13 | 0.75 | 1169 | 72 | 175 | 36 | 305 |
| XMT-G12 | 0.51 | 0.72 | 15.28 | 66.23 | 0.69 | 3.46 | 11.91 | 0.12 | 0.86 | 923 | 69 | 131 | 33 | 271 |
| XMT-G13 | 0.47 | 0.86 | 13.7 | 63.37 | 1.06 | 3.49 | 15.72 | 0.16 | 0.9 | 1234 | 66 | 165 | 40 | 273 |
| XMT-G14 | 0.3 | 0.73 | 15.5 | 66.96 | 0.65 | 5.23 | 9.22 | 0.2 | 0.88 | 2108 | 74 | 211 | 45 | 274 |
| XMT-G15 | 0.77 | 0.66 | 14 | 64.86 | 0.72 | 3.93 | 13.6 | 0.15 | 1.04 | 1007 | 76 | 156 | 29 | 274 |

Table A7. Chemical composition data of Guan ware samples from Jiaotanxia kiln site (Miao et al., 2012).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Jiaotanxia** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| No. | Na2O | MgO | Al2O3 | SiO2 | K2O | CaO | TiO2 | MnO | Fe2O3 | Rb | Sr | Y | Zr |
| 1 | 0.41 | 2.43 | 12.66 | 62.82 | 2.66 | 17 | 0.09 | 0.15 | 0.78 | 0.0148 | 0.0826 | 0.0046 | 0.0234 |
| 2 | 0.45 | 1.49 | 14.62 | 64.44 | 3.1 | 13.02 | 0.19 | 0.32 | 1.37 | 0.013 | 0.0616 | 0.0062 | 0.0231 |
| 3 | 0.29 | 1.44 | 13.96 | 63.04 | 2.94 | 15.99 | 0.18 | 0.17 | 0.98 | 0.0181 | 0.0684 | 0.0089 | 0.0246 |
| 4 | 0.53 | 1.71 | 13.36 | 64.42 | 3.16 | 14.22 | 0.15 | 0.35 | 1.11 | 0.0186 | 0.0605 | 0.01 | 0.0202 |
| 5 | 0.34 | 1.26 | 11.22 | 69.14 | 2.87 | 12.84 | 0.11 | 0.17 | 1.05 | 0.0128 | 0.0527 | 0.0051 | 0.0166 |
| 6 | 0.47 | 1.44 | 11.6 | 66.83 | 3.13 | 13.88 | 0.1 | 0.21 | 1.35 | 0.0165 | 0.0679 | 0.0043 | 0.0181 |
| 7 | 0.56 | 1.19 | 12.43 | 69.5 | 3.51 | 10.58 | 0.18 | 0.17 | 0.9 | 0.0129 | 0.0543 | 0.0037 | 0.0192 |
| 8 | 0.49 | 1.33 | 12.35 | 67.65 | 2.83 | 12.95 | 0.14 | 0.19 | 1.06 | 0.0145 | 0.0494 | 0.0051 | 0.0305 |
| 9 | 0.5 | 1.05 | 12.55 | 67.2 | 4.31 | 12.19 | 0.15 | 0.19 | 0.87 | 0.0132 | 0.0407 | 0.0037 | 0.029 |
| 10 | 0.43 | 0.94 | 12.56 | 69.5 | 3.95 | 10.8 | 0.07 | 0.12 | 0.64 | 0.0105 | 0.0576 | 0.0039 | 0.017 |
| 11 | 0.46 | 1.15 | 12.85 | 67.98 | 3.2 | 12.19 | 0.15 | 0.17 | 0.85 | 0.012 | 0.0435 | 0.0055 | 0.0201 |
| 12 | 0.3 | 1.05 | 13.54 | 67.35 | 3.41 | 11.22 | 0.47 | 0.28 | 1.38 | 0.015 | 0.0439 | 0.0043 | 0.0248 |
| 13 | 0.47 | 1.02 | 13.97 | 62.95 | 3.07 | 15.61 | 0.37 | 0.19 | 1.36 | 0.0152 | 0.0687 | 0.0074 | 0.0258 |
| 14 | 0.54 | 1.74 | 12.87 | 65.92 | 3.16 | 13.55 | 0.13 | 0.16 | 0.93 | 0.0141 | 0.0466 | 0.008 | 0.0171 |

Table A8. Chemical composition data of Guan ware samples (Miao et al., 2012).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Guan ware** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| No. | Na2O | MgO | Al2O3 | SiO2 | K2O | CaO | TiO2 | MnO | Fe2O3 | Rb | Sr | Y | Zr |
| G26 | 0.3 | 1.5 | 11.95 | 69.66 | 3.72 | 10.68 | 0.05 | 0.11 | 1.03 | 0.026 | 0.0394 | 0.0054 | 0.0143 |
| G27 | 0.4 | 0.89 | 11.49 | 71.05 | 3.9 | 9.78 | 0.11 | 0.06 | 1.31 | 0.0199 | 0.0491 | 0.0063 | 0.0166 |
| G28 | 0.25 | 0.92 | 13.39 | 70.19 | 4.97 | 8.17 | 0.08 | 0.07 | 0.95 | 0.0214 | 0.0346 | 0.0036 | 0.0148 |
| G29 | 1.37 | 0.3 | 11.7 | 73.33 | 3.8 | 7.51 | 0.06 | 0.05 | 0.88 | 0.0237 | 0.0103 | 0.0041 | 0.0075 |
| G30 | 0.58 | 1.04 | 12.19 | 69.35 | 3.95 | 10.95 | 0.05 | 0.13 | 0.76 | 0.0295 | 0.0474 | 0.0039 | 0.0155 |
| G31 | 0.47 | 1.33 | 13 | 68.43 | 4.25 | 10.12 | 0.08 | 0.1 | 1.22 | 0.017 | 0.0359 | 0.0069 | 0.0339 |
| G32 | 0.45 | 0.79 | 10.92 | 72.17 | 4.3 | 9.25 | 0.1 | 0.07 | 0.97 | 0.0183 | 0.0517 | 0.0062 | 0.0148 |
| G33 | 1.41 | 0.99 | 11.43 | 74.01 | 4.61 | 5.58 | 0.11 | 0.26 | 0.6 | 0.0133 | 0.0224 | 0.0039 | 0.0153 |
| G34 | 1.68 | 1.29 | 12.06 | 71.53 | 5.29 | 6.1 | 0.08 | 0.28 | 0.71 | 0.0174 | 0.0278 | 0.0026 | 0.0146 |
| G35 | 0.42 | 0.64 | 11.94 | 70.9 | 4.79 | 9.36 | 0.08 | 0.07 | 0.8 | 0.0188 | 0.0567 | 0.0039 | 0.0153 |
| G36 | 0.26 | 0.7 | 12.54 | 70.66 | 4.79 | 9.01 | 0.09 | 0.06 | 0.9 | 0.0183 | 0.05 | 0.005 | 0.0134 |
| G37 | 0.64 | 0.6 | 12.07 | 72.02 | 4.64 | 7.8 | 0.08 | 0.07 | 1.08 | 0.0191 | 0.0364 | 0.0061 | 0.0212 |
| G38 | 0.39 | 0.77 | 10.88 | 71.58 | 4.51 | 9.86 | 0.1 | 0.06 | 0.85 | 0.0186 | 0.0547 | 0.0061 | 0.0158 |
| G39 | 4.21 | 0.06 | 13.64 | 71.45 | 3.67 | 4.65 | 0.09 | 0.07 | 1.17 | 0.0251 | 0.0088 | 0.0046 | 0.0079 |
| G40 | 0.56 | 0.78 | 12.4 | 71.01 | 4.55 | 8.42 | 0.08 | 0.07 | 1.12 | 0.0189 | 0.0518 | 0.0045 | 0.0136 |

Table A9. Accuracy and precision of the secondary standards for LA-ICP-MS.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Secondary standard** | Std | Std | Average | **Ref.** | Absolute error | Relative error | S.D | R.S.D |
| **Contents (AYCF)** | NISTSRM 612 | NISTSRM 612 |  | **NISTSRM 612** |  |  |  |  |
| **Na2O** | 13.52257344 | 14.79462917 | 14.1586013 | **14.0011368** | -0.157464505 | -1.11% | 0.899479237 | 6.35% |
| **MgO** | 0.013718233 | 0.01225276 | 0.012985497 | **0.01276891** | -0.000216587 | -1.67% | 0.001036246 | 7.98% |
| **Al2O3** | 2.196085067 | 2.331226356 | 2.263655712 | **2.109726713** | -0.153928999 | -6.80% | 0.095559322 | 4.22% |
| **SiO2** | 67.62506498 | 69.49564878 | 68.56035688 | **71.90882573** | 3.348468846 | 4.88% | 1.322702495 | 1.93% |
| **P2O5** | 0.012315649 | 0.014214942 | 0.013265296 | **0.01168563** | -0.001579666 | -11.91% | 0.001343003 | 10.12% |
| **K2O** | 0.007589813 | 0.006793608 | 0.007191711 | **0.007986498** | 0.000794787 | 11.05% | 0.000563001 | 7.83% |
| **CaO** | 13.96707037 | 13.05633579 | 13.51170308 | **11.90009806** | -1.611605024 | -11.93% | 0.643986596 | 4.77% |
| **TiO2** | 0.00773893 | 0.006492729 | 0.007115829 | **0.00734052** | 0.000224691 | 3.16% | 0.000881197 | 12.38% |
| **MnO** | 0.004575539 | 0.005068817 | 0.004822178 | **0.00490656** | 8.43819E-05 | 1.75% | 0.0003488 | 7.23% |
| **Fe2O3** | 0.006937191 | 0.007868866 | 0.007403029 | **0.00656115** | -0.000841879 | -11.37% | 0.000658794 | 8.90% |
| **Zr** | 41.51621988 | 45.89094589 | 43.70358289 | **38** | -5.703582886 | -13.05% | 3.09339843 | 7.08% |
| **Nb** | 40.57207385 | 40.36447116 | 40.4682725 | **40** | -0.468272502 | -1.16% | 0.146797271 | 0.36% |
| **Hf** | 36.82020049 | 33.04925014 | 34.93472531 | **35** | 0.065274686 | 0.19% | 2.666464563 | 7.63% |
| **Ta** | 37.267262 | 43.63149226 | 40.44937713 | **40** | -0.449377134 | -1.11% | 4.500190373 | 11.13% |
| **Th** | 45.26556421 | 42.48594182 | 43.87575302 | **37.79** | -6.085753017 | -13.87% | 1.96548984 | 4.48% |
| **U** | 43.07605994 | 39.23845903 | 41.15725948 | **37.38** | -3.777259484 | -9.18% | 2.713593624 | 6.59% |

Table A10. Precision of the data for SEM-EDS by testing replication of the certified corning glass materials (oxide%).

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|   | Corning A |   |   |   | Corning B |   |   |   | Corning D |   |   |   |
| Analyte | Consensus | Relative error | S.D. | R.S.D. | Consensus | Relative error | S.D. | R.S.D. | Consensus | Relative error | S.D. | R.S.D. |
| Na | 12.9 | -14.51% | 0.17 | 1.26% | 15.99 | -12.01% | 0.21 | 3.27% | 1.01 | -8.31% | 0.08 | 6.23% |
| Mg | 3.18 | -9.23% | 0.09 | 2.79% | 1 | -8.72% | 0.05 | 3.98% | 3.92 | -9.31% | 0.06 | 1.66% |
| Al | 1.08 | -19.23% | 0.04 | 6.11% | 5.26 | -12.33% | 0.11 | 3.41% | 5.58 | -13.21% | 0.05 | 1.09% |
| Si | 66.12 | 3.01% | 0.41 | 0.92% | 64.25 | 5.91% | 0.62 | 0.99% | 56.38 | -0.81% | 0.37 | 0.88% |
| P | 0.08 | -100.00% | 0 | / | 0.04 | 580.11% | 0.09 | 7.21% | 4.12 | 11.29% | 0.08 | 1.42% |
| K | 2.69 | 8.21% | 0.06 | 1.91% | 1.01 | 17.55% | 0.02 | 2.41% | 11 | 3.10% | 0.09 | 0.96% |
| Ca | 4.87 | 3.69% | 0.12 | 2.10% | 8.67 | 5.22% | 0.03 | 0.52% | 13.99 | -3.12% | 0.18 | 1.97% |
| Ti | 0.66 | 5.09% | 0.03 | 4.72% | 0.08 | -100.00% | 0 | / | 0.36 | 12.21% | 0.08 | 21.24% |
| Cu | 0.98 | 5.11% | 0.09 | 6.24% | 2.55 | 8.31% | 0.08 | 3.01% | 1.39 | 4.68% | 0.07 | 9.71% |
| Ba | 0.36 | -4.41% | 0.04 | 5.21% | 0.09 | -100.00% | 0 | / | 1.51 | 21.22% | 0.04 | 16.03% |
| Pb | 0.1 | -100.00% | 0 | / | 0.41 | 28.12% | 0.07 | 8.82% | 0.98 | 16.46% | 0.04 | 19.83% |

Table A11. Primary standard block (type GP40, prepared by P&H Developments Ltd).

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Standard** | **Element** | **Standard Material** | **Standard** | **Element** | **Standard Material** | **Standard** | **Element** | **Standard Material** | **Standard** | **Element** | **Standard Material** |
| 1 | Ti | Metal | 11 | Ni | Metal | 21 | Ba | Barite | 30 | Bi | Metal |
| 2 | Na | Albite | 12 | Cu | Metal | 22 | Ta | Metal | 31 | Au | Metal |
| 3 | Mg | Pericla | 13 | Zn | Metal | 23 | Al | Corundum | 32 | Pt | Metal |
| 4 | Si, Ca | Wollastonite | 14 | Ge | Metal | 24 | Ca, F | Fluorite | 33 | V | Metal |
| 5 | Ga, P | Gallium Phosphide | 15 | Sb | Metal | 25 | Sr, F | Strontium fluoride | 34 | Andradite | synthetic glass |
| 6 | Cr | Metal | 16 | Rh | Metal | 26 | Sn | Cassiterite | 35 | Pb, Te | lead telluride |
| 7 | Fe, S | Pyrite | 17 | Mo | Metal | 27 | Cd, S | Cadmium sulphide | 36 | Se | selenium |
| 8 | K | Orthoclase | 18 | Ag | Metal | 28 | In, As | Indium arsonide | 37 | Y | Metal |
| 9 | Fe | Metal | 19 | Nb | Metal | 29 | Hg, Te | Mercury telluride | 38 | Mn | Metal |
| 10 | Co | Metal | 20 | W | Metal | 30 | Bi | Metal | 39 | La, B | Lanthanum hexaboride |

**References**

Duan, H., Lyn, C., Li, H., Ding, Y., Li, Y. & Miao, J. (2018). Nondestructive technological analysis of heirloom Ge wares. *Collection* **4**, 55–62.

Lahlil, S., Li, W. & Xu, J. M. (2013). Crack patterns morphology of ancient Chinese wares. *The Old Potter’s Almanack* **18**, 1–9.

Lahlil, S., Xu, J. & Li, W. (2015). Influence of manufacturing parameters on the crackling process of ancient Chinese glazed ceramics. *Journal of Cultural Heritage* **16**, 401–412.

Li, C. Z., Yang, J., Yao, L. X., Lu, W. C. & Chen, N. Y. (2005). Study on sherds excavated in Laohudong Kiln by chemometrics method. *Chinese Journal of Analytical Chemistry* **33**, 1465–1468.

Miao, J., LV, C.-L., Li, H. & Chen, T.-M. (2012). Non-destructive analysis of ‘original’Song dynasty Guan wares and later Imitations from the Palace Museum collections, Beijing. *Archaeometry* **54**, 955–973.

YAN, L., HUANG, Y., LIU, M., LIU, L., Li, L., FENG, S. & FENG, X. (2015). Study on the compositional features of Longquan celadon with black body and Southern Song Guan wares from Laohudong using EDXRF. *Journal of Archaeological Science: Reports* **4**, 395–400.