**Handheld X-ray Fluorescence (XRF) Versus Wavelength Dispersive XRF: Characterization of Chinese Blue and White Porcelain Sherds with Handheld and Laboratory-Type XRF Instruments**

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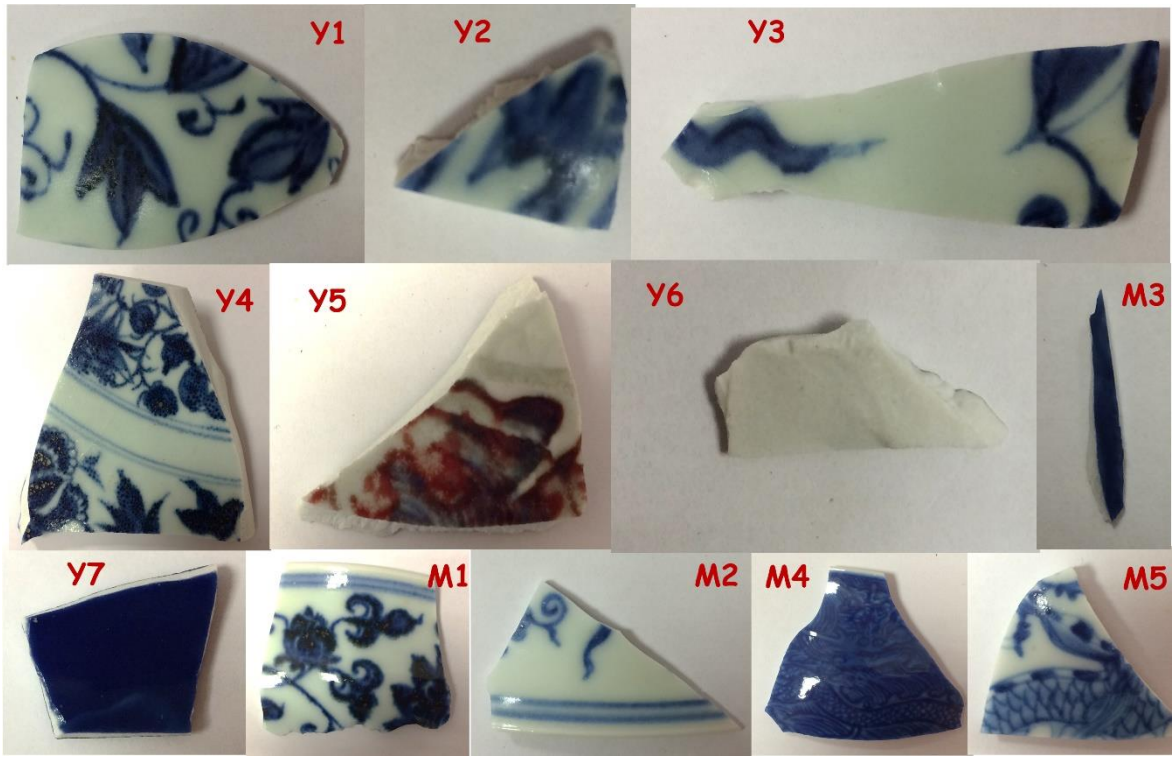


**Fig. S1** General view of the sherds (Y: Yuan, M: Ming)

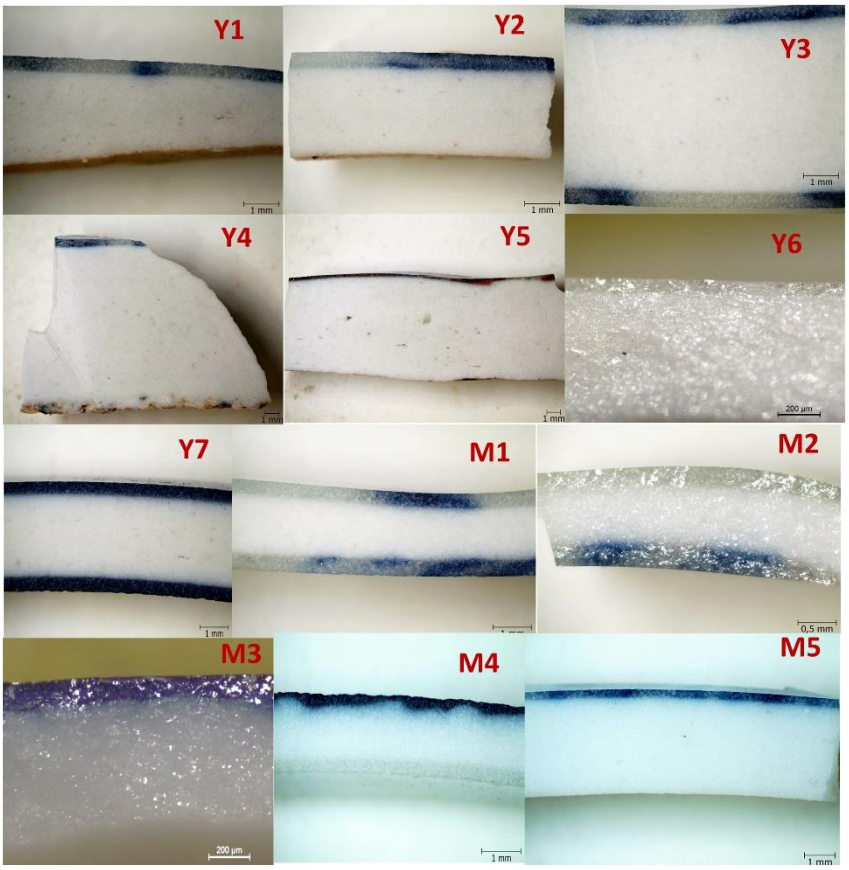


**Fig. S2** Representative images of the cross sections of the sherds (Y: Yuan, M: Ming)

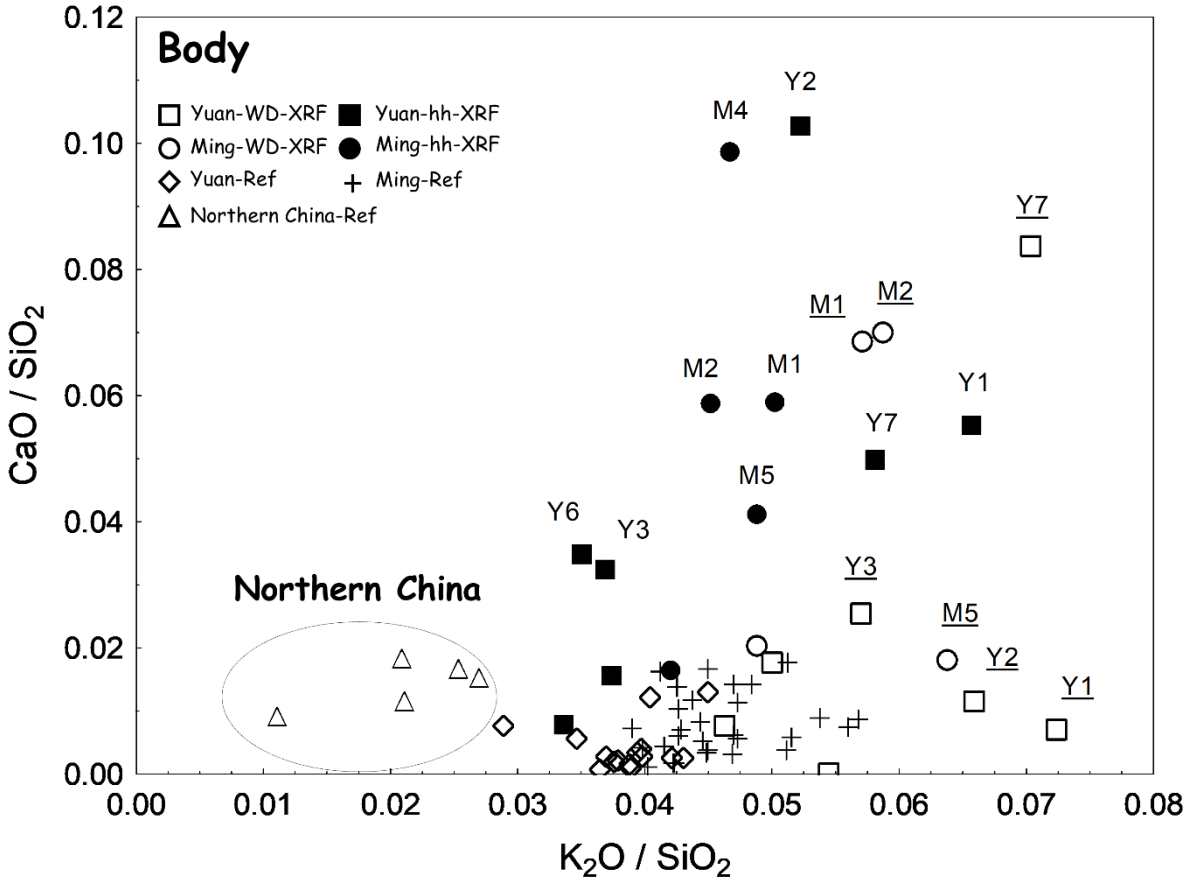


**Fig. S3** Binary scatter plots of the weight % ratios of CaO versus $K_2O$ normalized by $SiO_2$. Reference data is also included in the graph.[59-64]

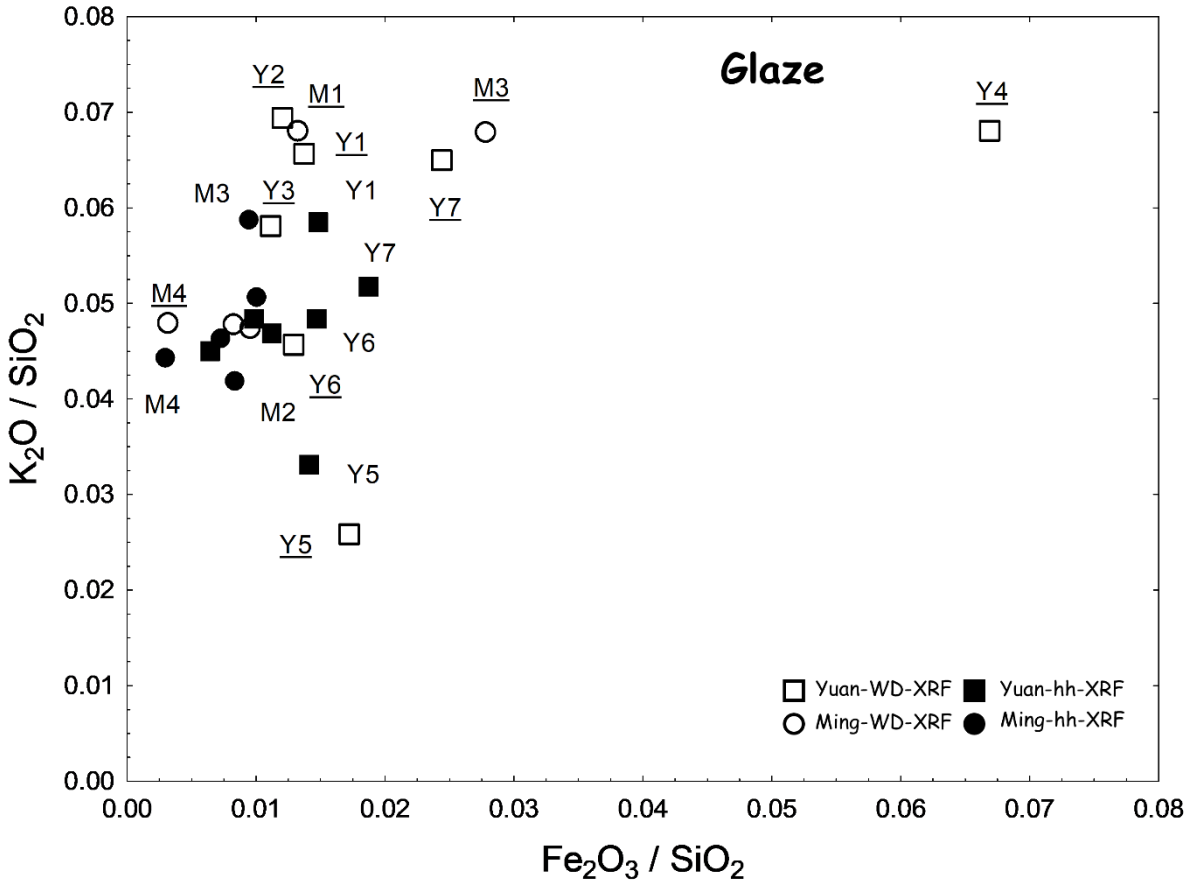


**Fig. S4** Binary scatter plots of the weight % ratios of $K_2O$ versus $Fe_2O_3$ normalized by $SiO_2$.

**Table S1.** Description of the studied sherds (Abb: Abbreviation)

| Inventory Code | Abb. | Description | Period | Glaze thickness, μm | Decor |
|---|---|---|---|---|---|
| 2.1.02.17 | Y1 | Yuhuchunping peony leaf sprays and blossoms vase | Jiangxi province, Jingdezhen, Yuan Dynasty, Mid 14th c. | 175 | Under glaze |
| 2.1.04.01-2 GS | Y2 | Fragmentary “Meng Tian” Qinghua Vase | Yuan Dynasty, 14th c. | 220 | Under glaze |
| 2.1.06.01-2 GS | Y3 | Fragmentary “Phoenix Charger” | Yuan Dynasty, 14th c. | 210 (recto & verso) | Under glaze |
| 2.2.09.2 GS | Y4 | Fragmentary Qinlin Charger | Yuan Dynasty, 14th c. | 115-260 | Under glaze |
| 2.2.22.3 | Y5 | Qinghua Charger | Yuan Dynasty, 14th c. | 75 | Under glaze |
| 2.3.01.01-02 GS | Y6 | White glazed flask moulded with a dragon, inscribed with the “Neifu” characters | Yuan Dynasty, Mid 14th c. | 55 | Transparent glaze |
| 4.1.00.01-2 GS | Y7 | Fragmentary monochrome cobalt blue underglaze moulded stembowl | Yuan Dynasty, 14th c. | 175 (recto)<br>210 (verso) | Blue coloured glaze |
| 7.2.01.01 GS | M1 | Fragmentary blue-and-white underglaze bowl inscribed with Shahada | Ming Dynasty, Xuande 1425-1435 AD | 235 (recto)<br>210 (verso) | Under glaze |
| 8.2.01.08 GS | M2 | Fragmentary blue-and-white underglaze lotus fishpond cup | Ming Dynasty, Chenghua Emperor 1465-1487 AD | 130 (recto & verso) | Under glaze |
| 8.9.03.8 | M3 | Fragmentary Doucai “Chicken Cup” | Ming Dynasty, Chenghua Emperor 1465-1487 AD | 75-120 | Blue coloured glaze |
| 8.9.03.17 | M4 | | | 125 (recto)<br>50-135 (verso) | Blue coloured glaze |
| 8.11.04.3 | M5 | Fragmentary blue-and-white “Nine Dragon” bottle | Ming Dynasty, Chenghua Emperor 1465-1487 AD | 115 | Under glaze |

**Table S2.** Body composition measured with hh-XRF and WD-XRF (n.a.: not available).

| | Major oxides (%) | | | | | Minor and trace elements (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | $SiO_2$ | $Al_2O_3$ | CaO | $K_2O$ | $Fe_2O_3$ | Mn | Rb | Sr | Zr | Zn | Ba |
| M1-hh-XRF | 65.84 | 16.77 | 3.87 | 3.31 | 1.35 | 2007 | 358 | 113 | 51 | 41 | 227 |
| M1-WD-XRF | 63.30 | 18.30 | 4.34 | 3.62 | 0.69 | 780 | 2000 | 350 | 350 | 20 | 540 |
| M2-hh-XRF | 63.64 | 19.57 | 3.74 | 2.89 | 0.67 | 739 | 270 | 123 | 39 | 39 | 241 |
| M2-WD-XRF | 70.10 | 22.80 | 4.90 | 4.12 | 1.13 | 1400 | 470 | 350 | 350 | 70 | 370 |
| M3-hh-XRF | 65.35 | 21.25 | 1.06 | 2.74 | 0.32 | 252 | 628 | 114 | 43 | 89 | 231 |
| M3-WD-XRF | 69.00 | 23.60 | 1.40 | 3.37 | 0.30 | 270 | 2500 | 430 | 430 | 110 | 1500 |
| M4-hh-XRF | 64.49 | 15.15 | 6.35 | 3.01 | 0.28 | 249 | 684 | 1343 | 47 | 88 | 0 |
| M4-WD-XRF | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| M5-hh-XRF | 67.58 | 17.70 | 2.78 | 3.30 | 0.52 | 316 | 513 | 35 | 65 | 90 | 0 |
| M5-WD-XRF | 72.50 | 19.90 | 1.30 | 4.63 | 0.77 | 320 | 2110 | 150 | 150 | 270 | 810 |
| Y1-hh-XRF | 58.27 | 16.92 | 3.22 | 3.83 | 1.27 | 754 | 584 | 44 | 90 | 87 | 386 |
| Y1-WD-XRF | 60.90 | 22.80 | 0.43 | 4.41 | 1.3 | 510 | 929 | 60 | 60 | 120 | 640 |
| Y2-hh-XRF | 63.10 | 18.13 | 6.47 | 3.30 | 1.00 | 731 | 411 | 51 | 56 | 79 | 0 |
| Y2-WD-XRF | 62.20 | 19.80 | 0.71 | 4.10 | 1.22 | 760 | 1350 | 230 | 203 | 250 | 1600 |
| Y3-hh-XRF | 67.55 | 19.95 | 2.18 | 2.49 | 0.65 | 590 | 297 | 126 | 41 | 66 | 517 |
| Y3-WD-XRF | 62.80 | 22.00 | 1.59 | 3.35 | 0.90 | 930 | 2600 | 630 | 630 | 220 | 2600 |
| Y4-hh-XRF | 69.12 | 20.16 | 0.54 | 2.32 | 1.14 | 549 | 286 | 48 | 62 | 52 | 0 |
| Y4-WD-XRF | 70.20 | 23.40 | 0.53 | 3.25 | 1.43 | 570 | 918 | 170 | 170 | 240 | 990 |
| Y5-hh-XRF | 67.51 | 20.84 | 1.04 | 2.52 | 1.07 | 768 | 618 | 55 | 42 | 65 | 1013 |
| Y5-WD-XRF | 65.70 | 24.20 | 0.00 | 3.58 | 1.20 | 1100 | 2230 | 100 | 100 | 230 | 440 |
| Y6-hh-XRF | 70.06 | 13.98 | 2.43 | 2.45 | 0.38 | 207 | 203 | 55 | 24 | 0 | 209 |
| Y6-WD-XRF | 65.10 | 24.30 | 1.15 | 3.26 | 1.29 | 1200 | 1300 | 370 | 370 | 230 | 490 |
| Y7-hh-XRF | 65.46 | 17.30 | 3.25 | 3.80 | 1.28 | 1975 | 425 | 55 | 66 | 744 | 215 |
| Y7-WD-XRF | 67.60 | 20.40 | 5.66 | 4.76 | 1.53 | 1700 | 1320 | 200 | 200 | 1350 | 640 |

**Table S3.** Glaze composition measured with hh-XRF and WD-XRF.

| | Major oxides (%) | | | | | Minor and trace elements (ppm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | $SiO_2$ | $Al_2O_3$ | CaO | $K_2O$ | $Fe_2O_3$ | Mn | Co | Rb | Sr | Zr | Zn | Ba | P | Ta | Pb |
| M1-hh-XRF | 68.39 | 11.09 | 8.95 | 3.45 | 0.68 | 448 | 431 | 293 | 127 | 52 | 0 | 275 | 440 | 35 | 11 |
| M1-WD-XRF | 65.00 | 14.00 | 12.30 | 4.42 | 0.86 | 0 | 0 | 260 | 190 | 0 | 0 | 0 | 0 | 0 | 0 |
| M2-hh-XRF | 70.27 | 11.73 | 7.34 | 2.93 | 0.58 | 477 | 89 | 247 | 129 | 44 | 0 | 212 | 388 | 30 | 0 |
| M2-WD-XRF | 71.00 | 12.50 | 9.76 | 3.36 | 0.68 | 0 | 0 | 271 | 170 | 60 | 0 | 0 | 0 | 0 | 0 |
| M3-hh-XRF | 68.15 | 14.53 | 5.00 | 3.99 | 0.64 | 359 | 12551 | 676 | 147 | 45 | 64 | 448 | 557 | 85 | 53 |
| M3-WD-XRF | 29.30 | 5.63 | 1.98 | 1.98 | 0.81 | 0 | 15800 | 1700 | 430 | 430 | 120 | 640 | 0 | 0 | 0 |
| M4-hh-XRF | 71.30 | 11.22 | 3.39 | 3.15 | 0.21 | 180 | 38 | 657 | 2465 | 34 | 59 | 0 | 664 | 53 | 29 |
| M4-WD-XRF | 73.90 | 12.40 | 3.62 | 3.54 | 0.23 | 180 | 0 | 625 | 3712 | 1 | 90 | 0 | 1400 | 0 | 0 |
| M5-hh-XRF | 67.19 | 13.30 | 7.12 | 3.10 | 0.48 | 625 | 478 | 408 | 74 | 59 | 64 | 246 | 613 | 49 | 16 |
| M5-WD-XRF | 72.40 | 11.90 | 9.39 | 3.46 | 0.60 | 1100 | 1000 | 370 | 100 | 60 | 0 | 0 | 1200 | 20 | 0 |
| Y1-hh-XRF | 68.39 | 10.29 | 7.73 | 3.99 | 1.01 | 2456 | 1298 | 437 | 83 | 52 | 0 | 447 | 430 | 46 | 19 |
| Y1-WD-XRF | 71.00 | 10.60 | 10.10 | 4.66 | 0.97 | 3240 | 1200 | 531 | 90 | 80 | 0 | 2500 | 380 | 150 | 30 |
| Y2-hh-XRF | 69.27 | 12.54 | 7.33 | 3.34 | 0.68 | 1291 | 633 | 373 | 76 | 46 | 0 | 0 | 379 | 34 | 18 |
| Y2-WD-XRF | 69.00 | 12.70 | 11.40 | 4.79 | 0.83 | 1400 | 450 | 568 | 120 | 60 | 0 | 850 | 0 | 0 | 100 |
| Y3-hh-XRF | 70.81 | 10.07 | 6.35 | 3.18 | 0.45 | 355 | 0 | 427 | 115 | 47 | 0 | 699 | 362 | 48 | 15 |
| Y3-WD-XRF | 69.00 | 12.20 | 11.10 | 4.00 | 0.77 | 1200 | 0 | 551 | 160 | 40 | 110 | 2400 | 1600 | 0 | 0 |
| Y4-hh-XRF | 72.09 | 10.71 | 7.65 | 3.37 | 0.81 | 521 | 624 | 464 | 90 | 53 | 89 | 1464 | 1282 | 46 | 22 |
| Y4-WD-XRF | 69.00 | 8.46 | 9.41 | 4.69 | 4.62 | 0 | 630 | 0 | 130 | 519 | 6310 | 1100 | 0 | 0 | 0 |
| Y5-hh-XRF | 69.82 | 9.63 | 4.56 | 2.31 | 0.98 | 1965 | 582 | 420 | 231 | 165 | 0 | 9782 | 467 | 47 | 21 |
| Y5-WD-XRF | 70.00 | 8.96 | 9.15 | 1.80 | 1.21 | 1500 | 330 | 397 | 282 | 0 | 0 | 69100 | 0 | 0 | 0 |
| Y6-hh-XRF | 68.75 | 14.60 | 2.63 | 3.32 | 1.01 | 730 | 112 | 375 | 79 | 49 | 70 | 376 | 459 | 49 | 39 |
| Y6-WD-XRF | 74.30 | 13.50 | 2.72 | 3.39 | 0.96 | 870 | 0 | 285 | 80 | 40 | 120 | 1800 | 0 | 0 | 0 |
| Y7-hh-XRF | 69.39 | 10.12 | 8.79 | 3.58 | 1.30 | 5354 | 5593 | 365 | 76 | 49 | 925 | 224 | 436 | 43 | 37 |
| Y7-WD-XRF | 61.30 | 9.77 | 5.98 | 3.98 | 1.50 | 8830 | 7820 | 1200 | 290 | 250 | 1380 | 1000 | 420 | 0 | 410 |

**Table S4.** Blue decor analysis measured with hh-XRF and WD-XRF.

| | Major elements (%) | | | | Minor and trace elements (ppm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | Si | Mn | Fe | Co | Zn | As | Cu | Sn | Ni | V | Mn/Co | Fe/Co |
| M1-hh-XRF | 31.97 | 0.38 | 1.49 | 0.29 | 0 | 12 | 0 | 0 | 109 | 0 | 1.31 | 5.13 |
| M1-WD-XRF | 16.50 | 0.43 | 1.34 | 0.33 | 80 | 10 | 100 | 110 | 40 | 130 | 1.30 | 4.06 |
| M2-hh-XRF | 32.85 | 0.12 | 0.42 | 0.03 | 0 | 0 | 0 | 0 | 53 | 0 | 4.00 | 14.00 |
| M2-WD-XRF | 29.60 | 0.15 | 0.84 | 0.03 | 20 | 20 | 110 | 260 | 130 | 270 | 5.00 | 28.00 |
| M3-hh-XRF | 31.86 | 0.03 | 0.45 | 1.25 | 64 | 49 | 85 | 165 | 58 | 2931 | 0.02 | 0.36 |
| M3-WD-XRF | 13.70 | 0.02 | 0.57 | 1.58 | 120 | 140 | 260 | 240 | 0 | 350 | 0.01 | 0.36 |
| M4-hh-XRF | 33.33 | 0.03 | 0.41 | 1.18 | 45 | 32 | 0 | 0 | 109 | 0 | 0.02 | 0.34 |
| M4-WD-XRF | 28.30 | 0.06 | 0.82 | 2.25 | 40 | 50 | 90 | 260 | 30 | 70 | 0.02 | 0.36 |
| M5-hh-XRF | 31.55 | 0.08 | 0.38 | 0.08 | 71 | 0 | 0 | 0 | 69 | 0 | 1.00 | 4.75 |
| M5-WD-XRF | 28.60 | 0.19 | 0.63 | 0.13 | 200 | 80 | 120 | 560 | 250 | 116 | 1.46 | 4.84 |
| Y1-hh-XRF | 31.97 | 0.32 | 0.88 | 0.19 | 0 | 8 | 0 | 0 | 0 | 0 | 1.68 | 4.63 |
| Y1-WD-XRF | 18.30 | 0.21 | 0.58 | 0.08 | 70 | 0 | 130 | 180 | 40 | 0 | 2.62 | 7.25 |
| Y2-hh-XRF | 32.38 | 0.19 | 0.64 | 0.10 | 0 | 0 | 0 | 0 | 0 | 0 | 1.90 | 6.40 |
| Y2-WD-XRF | 29.60 | 0.14 | 0.77 | 0.05 | 50 | 0 | 120 | 50 | 0 | 120 | 2.80 | 15.40 |
| Y3-hh-XRF | 33.10 | 0.11 | 0.46 | 0.05 | 0 | 0 | 0 | 0 | 0 | 0 | 2.20 | 9.20 |
| Y3-WD-XRF | 24.60 | 0.11 | 0.64 | 0.01 | 100 | 20 | 310 | 330 | 30 | 140 | 11.00 | 64 |
| Y4-hh-XRF | 33.70 | 0.06 | 0.83 | 0.25 | 92 | 34 | 114 | 0 | 0 | 0 | 0.24 | 3.32 |
| Y4-WD-XRF | 25.70 | 0.03 | 3.86 | 0.06 | 6140 | 0 | 310 | 9300 | 50 | 140 | 0.50 | 64.33 |
| Y5-hh-XRF | 32.64 | 0.31 | 0.84 | 0.13 | 0 | 37 | 1024 | 488 | 0 | 0 | 2.38 | 6.46 |
| Y5-WD-XRF | 30.20 | 0.20 | 1.53 | 0.05 | 120 | 10 | 2430 | 2200 | 190 | 0 | 4.00 | 30.60 |
| Y7-hh-XRF | 32.44 | 0.53 | 0.91 | 0.56 | 925 | 0 | 41 | 0 | 65 | 0 | 0.94 | 1.62 |
| Y7-WD-XRF | 28.70 | 0.99 | 1.55 | 0.91 | 1380 | 0 | 110 | 330 | 354 | 280 | 1.08 | 1.70 |