

<sup>1</sup>Campbell LS, Compston W, Sircombe KN and Wilkinson CC: Zircon from the East Orebody of the Bayan Obo Fe-Nb-REE deposit, China, and SHRIMP ages for carbonate-related magmatism and REE mineralization events. *Contributions to Mineralogy and Petrology*. [Linda.Campbell@manchester.ac.uk](mailto:Linda.Campbell@manchester.ac.uk), University of Manchester, UK.

**ESM 2** (a) Table of trace element concentrations (ppm) in two standards by LA-ICP-MS. (b) REE concentrations (ppm) in zircon standard 91500 analysed by LA-ICP-MS. Error bars relate to the working values of Wiedenbeck et al. (2004).

(a)

| REE (ppm)    | NIST 612 glass               |                         |          |                    |               |       |                  | Zircon 91500            |        |                 |                         |            |                    |               |       |                |
|--------------|------------------------------|-------------------------|----------|--------------------|---------------|-------|------------------|-------------------------|--------|-----------------|-------------------------|------------|--------------------|---------------|-------|----------------|
|              | Reported                     | Determined (this study) |          |                    |               |       |                  | Reported                |        |                 | Determined (this study) |            |                    |               |       |                |
|              | Certified calibration values | B03 30µm                | C03 30µm | Mean of 30µm spots | Duplicate RSD | % RSD | C18: 10µm spot # | Wiedenbeck et al (2004) | % RSD* | % RSD as values | B04 - 30µm              | C04 - 30µm | Mean of 30µm spots | Duplicate RSD | % RSD | C17: 10µm spot |
| La           | 35.77                        | 39.07                   | 36.63    | 37.85              | 1.73          | 4.56  | 36.89            | 0.006                   | 54     | 0.003           |                         |            |                    |               |       |                |
| Ce           | 38.35                        | 38.10                   | 35.92    | 37.01              | 1.54          | 4.17  | 35.38            | 2.56                    | 10     | 1.382           | 2.56                    | 2.59       | 2.57               | 0.02          | 0.94  | 1.90           |
| Pr           | 37.16                        | 38.57                   | 36.56    | 37.57              | 1.42          | 3.78  | 37.00            | 0.024                   | 63     | 0.013           | 0.01                    | 0.01       | 0.01               | 0.00          | 10.15 |                |
| Nd           | 35.24                        | 38.70                   | 35.77    | 37.23              | 2.07          | 5.57  | 37.71            | 0.24                    | 16     | 0.130           | 0.22                    | 0.30       | 0.26               | 0.06          | 22.87 |                |
| Sm           | 36.72                        | 40.36                   | 39.15    | 39.75              | 0.86          | 2.15  | 39.46            | 0.50                    | 15     | 0.270           | 0.41                    | 0.56       | 0.48               | 0.10          | 21.45 | 0.41           |
| Eu           | 34.44                        | 36.30                   | 34.87    | 35.58              | 1.01          | 2.84  | 34.20            | 0.24                    | 12     | 0.130           | 0.26                    | 0.25       | 0.25               | 0.01          | 2.48  | 0.14           |
| Gd           | 36.95                        | 40.82                   | 39.91    | 40.37              | 0.64          | 1.60  | 41.89            | 2.21                    | 11     | 1.193           | 2.48                    | 2.57       | 2.52               | 0.07          | 2.72  | 2.02           |
| Tb           | 35.92                        | 39.62                   | 38.67    | 39.14              | 0.67          | 1.71  | 39.28            | 0.86                    | 8      | 0.464           | 0.90                    | 0.93       | 0.92               | 0.02          | 2.31  | 0.66           |
| Dy           | 35.97                        | 40.36                   | 39.43    | 39.89              | 0.66          | 1.65  | 39.64            | 11.8                    | 7      | 6.372           | 13.01                   | 13.10      | 13.06              | 0.06          | 0.48  | 10.35          |
| Ho           | 37.87                        | 41.91                   | 42.34    | 42.12              | 0.31          | 0.73  | 41.47            | 4.84                    | 7      | 2.614           | 5.07                    | 5.15       | 5.11               | 0.06          | 1.09  | 3.81           |
| Er           | 37.43                        | 42.87                   | 41.93    | 42.40              | 0.66          | 1.56  | 44.61            | 24.6                    | 10     | 13.284          | 27.30                   | 27.86      | 27.58              | 0.40          | 1.44  | 22.35          |
| Tm           | 37.55                        | 41.78                   | 41.72    | 41.75              | 0.04          | 0.10  | 42.09            | 6.89                    | 5      | 3.721           | 7.65                    | 7.68       | 7.67               | 0.02          | 0.31  | 5.90           |
| Yb           | 39.95                        | 44.38                   | 45.50    | 44.94              | 0.80          | 1.77  | 45.55            | 73.9                    | 5      | 39.906          | 84.48                   | 83.39      | 83.93              | 0.77          | 0.92  | 61.79          |
| Lu           | 37.71                        | 43.18                   | 42.61    | 42.90              | 0.40          | 0.94  | 43.57            | 13.1                    | 8      | 7.074           | 12.94                   | 13.38      | 13.16              | 0.31          | 2.38  | 12.35          |
| Others (ppm) |                              |                         |          |                    |               |       |                  |                         |        |                 |                         |            |                    |               |       |                |
| Na           | 103000                       | 97993                   | 96780    | 97387              | 858           | 0.88  | 95821            |                         |        |                 |                         | 15.4       | 15.39              |               | 0.00  |                |
| Al           | 11200                        | 11606                   | 11439    | 11522              | 118           | 1.02  | 11648            |                         |        |                 | 13.3                    | 8.7        | 10.98              | 3.27          | 29.76 | 6.2            |
| Si           | 327087                       | 339900                  | 334000   | 336950             | 4172          | 1.24  | 339900           |                         |        |                 | 152800                  | 152800     | 152800             | 0.00          | 0.00  | 152800         |
| Ca           | 85264                        | 91611                   | 87841    | 89726              | 2666          | 2.97  | 80140            |                         |        |                 |                         |            |                    |               |       |                |
| Sc           | 41.1                         | 46.2                    | 45.6     | 45.91              | 0.38          | 0.83  | 47.4             |                         |        |                 | 97.4                    | 96.7       | 97.05              | 0.44          | 0.45  | 81.2           |
| Ti           | 48.1                         | 55.1                    | 49.1     | 52.08              | 4.25          | 8.16  | 48.9             |                         |        |                 | 6.6                     | 6.6        | 6.60               | 0.05          | 0.76  |                |
| Mn           | 38.4                         | 39.0                    | 36.6     | 37.77              | 1.69          | 4.49  | 37.0             |                         |        |                 |                         |            |                    |               |       |                |
| Fe           | 56.3                         | 55.0                    | 56.5     | 55.73              | 1.06          | 1.90  | 76.5             |                         |        |                 |                         |            |                    |               |       |                |
| Sr           | 76.2                         | 81.1                    | 76.2     | 78.61              | 3.47          | 4.42  | 71.0             | 0.052                   | 8      | 0.028           | 0.04                    | 0.05       | 0.04               | 0.01          | 11.49 |                |
| Y            | 38.3                         | 44.7                    | 41.8     | 43.28              | 2.07          | 4.78  | 44.4             | 140                     | 10     | 75.600          | 147.5                   | 152.6      | 150.05             | 3.58          | 2.39  | 128.4          |
| Nb           | 38.1                         | 41.2                    | 38.4     | 39.79              | 2.00          | 5.03  | 41.5             | 0.79                    | 8      | 0.427           | 0.8                     | 0.8        | 0.80               | 0.02          | 2.34  | 0.6            |
| Sn           | 38.0                         | 38.9                    | 35.8     | 37.38              | 2.20          | 5.87  | 41.0             |                         |        |                 | 1.2                     | 1.5        | 1.33               | 0.20          | 15.10 | 3.2            |
| Ba           | 37.7                         | 39.0                    | 35.9     | 37.45              | 2.23          | 5.95  | 37.2             | 0.06                    | 43     | 0.032           |                         |            |                    |               |       |                |
| Hf           | 34.77                        | 39.59                   | 39.64    | 39.62              | 0.04          | 0.10  | 40.51            | 5895                    |        |                 | 5497                    | 5587       | 5542.04            | 63.97         | 1.15  | 4865           |
| Ta           | 39.77                        | 44.88                   | 44.27    | 44.57              | 0.43          | 0.97  | 46.71            |                         |        |                 | 0.51                    | 0.55       | 0.53               | 0.03          | 6.46  | 0.43           |
| Pb           | 38.96                        | 37.62                   | 36.81    | 37.21              | 0.57          | 1.53  | 31.34            | 1.76                    | 2      | 0.950           | 2.67                    | 2.86       | 2.76               | 0.14          | 4.96  | 2.51           |
| Th           | 37.23                        | 42.29                   | 41.36    | 41.83              | 0.66          | 1.58  | 41.39            | 29.9                    | 7      | 16.146          | 30.27                   | 31.28      | 30.78              | 0.71          | 2.31  | 24.68          |
| U            | 37.15                        | 36.96                   | 35.69    | 36.32              | 0.90          | 2.48  | 33.18            | 80.0                    | 10     | 43.200          | 76.18                   | 77.48      | 76.83              | 0.92          | 1.19  | 58.19          |

**Notes:**

\* Wiedenbeck et al (2004), from their *Table 10*

# 10 µm spot is within 5% error when compared with duplicate means of 30µm spots, except for Fe (likely spurious contamination).

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(b)

