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THE APPLICATION OF U-Pb GEOCHRONOLOGY TO TITANITE BY LASER ABLATION ICP-MS

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Several large titanite crystals were collected from Khan copper mine, Namibia - Africa with intention of establishing a reference in the $^{206}\text{Pb}/^{238}\text{U}$ ratio to normalize titanite unknown. Previous analysis from three distinct authors shown the following results: $^{207}\text{Pb}/^{206}\text{Pb}$ age of 518 ± 2 Ma and 522.3 ± 2.3 Ma by TIMS and concordia age of 516.9Ma by LA-ICP-MS.

Isotopic data were acquired using a NEPTUNE – ICP-MS coupled by an excimer laser ablation system. The cup configurations utilized to U-Pb data acquisition were $\text{IC}_3 = ^{202}\text{Hg}$, $\text{IC}_4 = ^{204}(\text{Hg}+\text{Pb})$, $\text{L}_4 = ^{206}\text{Pb}$, $\text{IC}_6 = ^{207}\text{Pb}$, $\text{L}_3 = ^{208}\text{Pb}$, $\text{H}_2 = ^{232}\text{Th}$ and $\text{H}_4 = ^{238}\text{U}$ where L and H were low and high mass to faraday cup position and ICs are ion counting (continuous dynode system). The ICP configurations were: Radio Frequency power = 1100W, cool gas flow rate = 15L/min (Ar), auxiliary gas flow rate = 0.7L/min (Ar), sample gas flow rate = 0.6L/min. Laser Setup: energy = 6mJ, repetition rate = 5 Hz, spot size = 38 μm , helium carrier gas = 0.65L/min. The routine U-Pb analysis consists of 2 blanks, 2 NIST, 3 external standard, 13 unknown grains, 2 external standards and 2 blanks measurement. Each run consist of 40

cycles with 1 second per cycle. The ^{204}Hg interference on ^{204}Pb was corrected by ^{202}Hg where the value of $^{204}\text{Hg}/^{202}\text{Hg}$ ratio is 4.2. To $^{207}\text{Pb}/^{206}\text{Pb}$ ratio normalization a combination of NIST and external standards was used and the normalization of $^{206}\text{Pb}/^{238}\text{U}$ ratio an external titanite standard was used.

Khan titanite typically contains significant quantities of common Pb, therefore the accuracy of $^{207}\text{Pb}/^{206}\text{Pb}$ and $^{206}\text{Pb}/^{238}\text{U}$ ratios obtained is critically dependent on the correct assessment of the common Pb component. For this paper, the residual common Pb was corrected based on ^{204}Pb measurement using terrestrial composition (Stacey Kramer). The range of total common Pb on Khan titanite is among 1 and 8 ppm. The total radiogenic Pb is between 27 and 44 ppm, the $^{232}\text{Th}/^{238}\text{U}$ ratio ranged from 0.5 to 1.8 and U concentration varied among 220 and 460 ppm.

The concordia diagram from 4 Khan titanite fragments, using external standard of the same titanite (520Ma), show a age of 528 ± 6 Ma. The MSWD value of 3.8 is too high indicating low homogeneity for the analyzed fragments.