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Supplemental Material

Supplemental Text. Analytical methods.

Supplemental Table S1. Zircon U–Pb age dating results.

Supplemental Table S2. Argon step-heating data.

ANALYTICAL METHODS

1 Crystallographic preferred orientations of quartz

The crystallographic preferred orientations (CPOs) of quartz of deformed rocks were determined using a scanning electron microscope JEOL JSM-6490 eqiupped with a Nordlys-S electron back-scatter diffraction (EBSD) system at the State Key Laboratory for Mineral Deposits Research, Nanjing University. Thin sections were cut parallel to the structural XY plane (X: parallel to the lineation, Y: parallel to the foliation). The EBSD measurements were conducted with an accelerating voltage of 20 kV, a spot size of 60 μm and a working distance of 18–22 mm. Diffraction patterns were automatically collected and indexed to determine using Channels 5 software form HKL Technology. The detailed description of this method was given in Prior et al. (1999).

2 Zircon U-Pb dating

Zircon grains were separated by heavy liquid and magnetic techniques, hand-picked under a binocular microscope, and mounted in epoxy resin. The internal structure of the zircon grains was characterized via cathodoluminescence (CL) imaging using a HITACHI SUI1510 scanning electron microscope at the State Key Laboratory for Mineral Deposits Research, Nanjing University.

The U and Pb isotope compositions of zircon were determined in situ using an Agilent 7500a laser ablation system coupled with an iCAP RQ ICP–MS at the State Key Laboratory of Mineral Deposits Research, Nanjing University. The laser was operated at an energy density of 6.5/cm^2, a spot diameter of 32 μm, and a repetition rate of 5 Hz for 70 s of sample ablation. The homogeneous zircon reference standard GEMOC GJ-1 (^{207}Pb/^{206}Pb age of 608.5 ± 0.4 Ma and ^{206}Pb/^{238}U age of 599.8 ± 4.5 Ma; Jackson et al., 2004) was analyzed twice every twelve analyses, and was used as an external standard for mass bias and instrument drift correction. The Mud Tank zircon standard was analyzed once every twelve analyses as an independent control. Analyses yielded a weighted mean ^{206}Pb/^{238}U age of 728 ± 6 Ma (2σ; MSWD = 0.69), which is consistent with the age determined by isotope dilution–thermal ionization mass spectrometry

(732 ± 5 Ma; Black and Gulson, 1978). For the age calculation, we used the Isoplot 3.0 toolkit on Microsoft Excel (Ludwig, 2003)

3 Muscovite $^{40}Ar/^{39}Ar$ dating

Muscovite crystals from among samples were separated from crushed deformed rocks using conventional heavy liquid and magnetic techniques, handpicked under a binocular microscope, and then cleaned in an ultrasonic bath with Milli-Q water.

These muscovite samples packed in aluminum foil, as well as the reference biotite standard ZBH-25 (132.7 ± 1.2 Ma and K content of 7.6%; Wang, 1983), were irradiated for 21 h in a Swimming Pool Reactor at the China Institution of Atomic Energy. The mean J-values computed from standard grains within the small pits ranges from 0.00690085 to 0.007283087. The ^{39}Ar and ^{40}Ar contents of the samples were measured using a ARGUS VI multi-collector mass spectrometer and the $^{40}Ar/^{39}Ar$ step-heated using a 50 W CO_2 laser at the State Key Laboratory of Isotope Geochemistry, Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, Guangzhou. The analytical conditions and procedure follow those described in Bai et al. (2018). All ages were calculated using 5.531×10^{-10} a^{-1} as the total decay constant for ^{40}K (Renne et al., 2011). The correction factors used for interfering argon isotopes derived from irradiated CaF_2 and K_2SO_4 5.97×10^{-4} for $(^{39}Ar/^{37}Ar)_{Ca}$, 1.99×10^{-4} for $(^{36}Ar/^{37}Ar)_{Ca}$, and 6.30×10^{-4} for $(^{40}Ar/^{39}Ar)_{K}$. The platea ages comprise at least three consecutive steps of 70% ^{39}Ar, and the probability of fit (P) of at least 0.05. The age uncertainty for each apparent age is given at 2σ. The argon isotope data was calculated and plotted using the software ArArCALC (version 2.4, Koppers, 2002).

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