GOVERNMENT OF WESTERN AUSTRALIA

GSWA Geochronology Record

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Department of Mines, Industry Regulation and Safety

213005.1.pdf *Geochronology Record 1903*

213005.1: hydrothermal breccia, John Galt prospect

(Red Rock Formation; Red Rock Basin, Halls Creek Orogen)

IOH Fielding, Y Lu and S Morin-Ka

Location and sampling

DIXON RANGE SE52-06, TURKEY CREEK 4563 — Zone 52, MGA 417686E 8087453N
Warox Site SMKREE000041 — Sampled on 11 September 2013

This sample was collected from a pile of rocks at the bottom of a scarp at the John Galt prospect, about 13.5 km west-northwest of the Bungle Bungle Outcamp Ruins, 7.5 km south-southwest of the Lumuku Community and 2.4 km east of Corkwood Yard.

Geological context

The unit sampled is a rare earth element (REE)-rich breccia within a sandstone of the Red Rock Formation, Halls Creek Orogen. The Red Rock Formation consists of lithic quartz sandstone, pink feldspathic quartz sandstone, pebbly sandstone, conglomerate, siltstone, mudstone, basalt flows, and basaltic breccia (Phillips, 2023). The Red Rock Formation unconformably overlies sedimentary rocks of the Winnama Formation (Maidment et al., 2022) and occurs in thin fault-bound slivers along the Halls Creek Fault and larger fault-bound outcrops in the Osmond Range (Phillips, 2023). At this location, the sample was collected to date hydrothermal activity related to REE mineralization at the John Galt prospect. A sample of muscovite–chlorite schist from the Winnama Formation about 7.8 km to the north-northeast yielded a maximum depositional age of 1870 ± 6 Ma (GSWA 218318, Lu et al., 2018). A similar hydrothermal breccia from this location yielded a weighted mean $^{207}Pb^{*}/^{206}Pb^{*}$ date of 1619 ± 9 Ma, interpreted as the age of a hydrothermal event (GSWA 213004, Fielding et al., 2023).

Petrographic description

The sample is a xenotime–quartz breccia within a sandstone, consisting of about 50% quartz, 30% xenotime, 10% sericite, 5% hematite, 4% lithic clasts, 1% pyrite and accessory zircon. Quartz occurs as euhedral crystals that are mostly less than 4 mm in size, contain abundant fluid inclusions, and are often surrounded by the xenotime. Xenotime is translucent to opaque, euhedral, up to 1 mm in size, and contains abundant inclusions of quartz, hematite and pyrite. Xenotime also occurs as >100 µm, anhedral, inclusion free, overgrowths on zircon. Lithic clasts consist of poorly rounded, poorly sorted sandstone, with equigranular quartz and sericite. The sample is not deformed or metamorphosed. Late-stage quartz veinlets crosscut the xenotime–quartz breccia.

Xenotime morphology

Xenotimes from this sample are translucent to opaque, and anhedral. The analysed crystals occur as >100 µm-wide and inclusion-free overgrowths on zircon. A backscattered electron (BSE) image of a representative xenotime is shown in Figure 1.

Analytical details

This sample was analysed on 20 October 2014, using SHRIMP-B. Xenotimes were analysed in plugs cut from polished thin sections, following procedures described by Fletcher et al. (2010). During the analytical session, a 30 mm Köhler aperture was used to obtain a primary beam diameter of 10–15 mm. Retardation was applied to reduce scattered ions. U–Pb isotopic data were calibrated against reference xenotime MG1, and matrix corrections were applied using secondary standards Xeno1, BS-1 and z6413 following Fletcher et al. (2004). An instrumental fractionation correction on ^{204}Pb-corrected $^{207}Pb/^{206}Pb$ ages was applied using Xeno1 by the method of Fletcher et al. (2004). Calibration uncertainties are included in the errors of $^{238}U/^{206}Pb^{*}$ ratios and dates listed in Table 1 (provided in the Links section). Common-Pb corrections were applied to all analyses using contemporaneous isotopic compositions determined according to the model of Stacey and Kramers (1975).

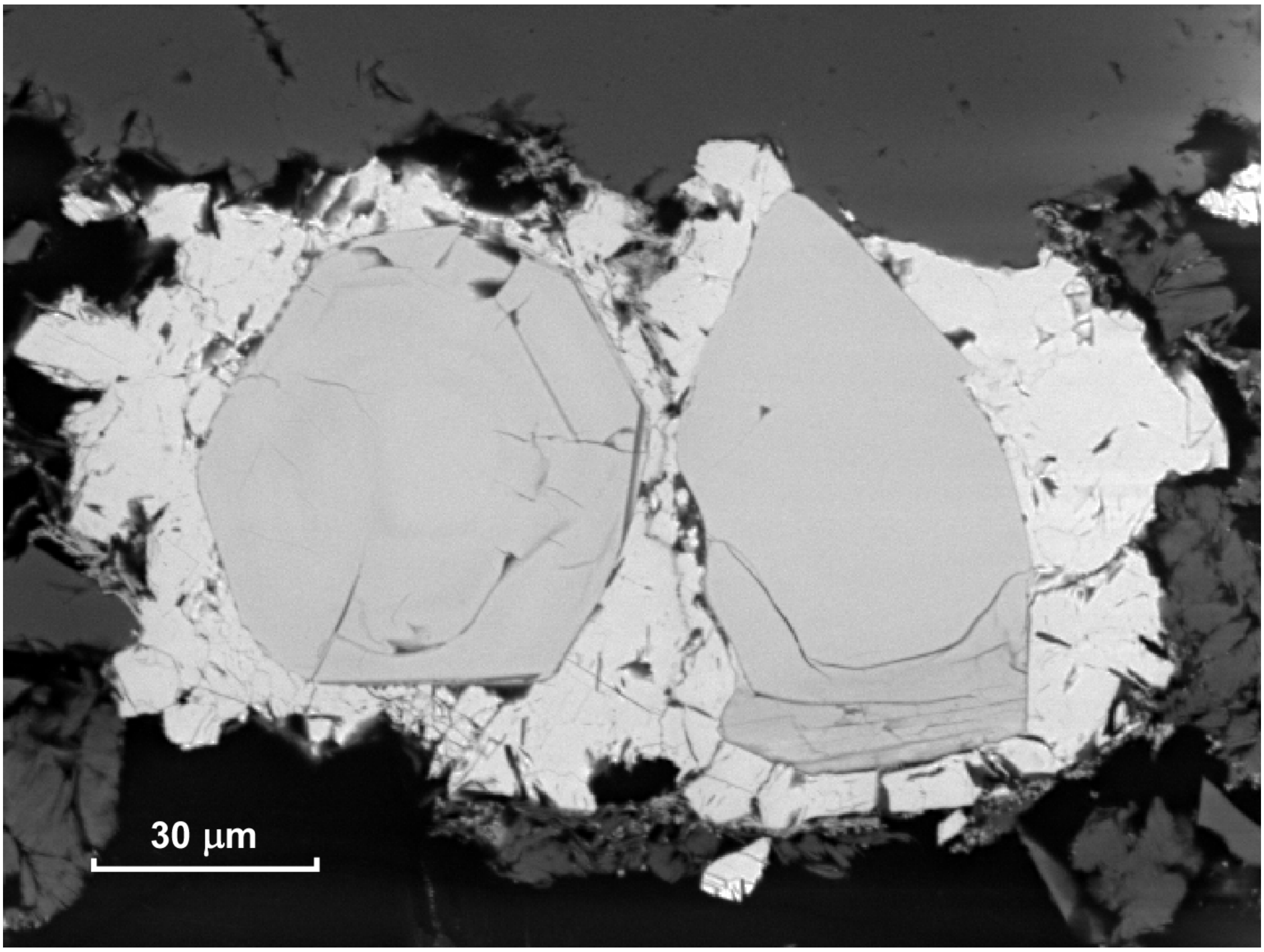

Figure 1. Backscattered electron image of a representative xenotime from sample 213005: hydrothermal breccia, John Galt prospect. The two minerals in the middle of the sample are zircon (medium grey) are overgrown by xenotime (light grey) and surrounded by quartz (dark grey) and epoxy (black)

Results

Seven analyses were obtained from four xenotimes. Results are listed in Table 1 and shown in a concordia diagram (Fig. 2).

Interpretation

The analyses are concordant to strongly discordant (Table 1), and can be divided into two groups, based on their $^{207}Pb^{*}/^{206}Pb^{*}$ ratios.

Group M comprises six analyses of three xenotimes (Table 1), which yield a weighted mean $^{207}Pb^{*}/^{206}Pb^{*}$ date of 1608 ± 13 Ma (MSWD = 2.1).

Group P comprises a single analysis (Table 1), which yield a $^{207}Pb^{*}/^{206}Pb^{*}$ date of 1555 ± 9 Ma (1σ).

The date of 1608 ± 13 Ma for the six analyses in Group M is interpreted as the age of a hydrothermal event. The date of 1555 ± 9 Ma (1σ) for the single analysis in Group P is interpreted to reflect loss of radiogenic Pb.

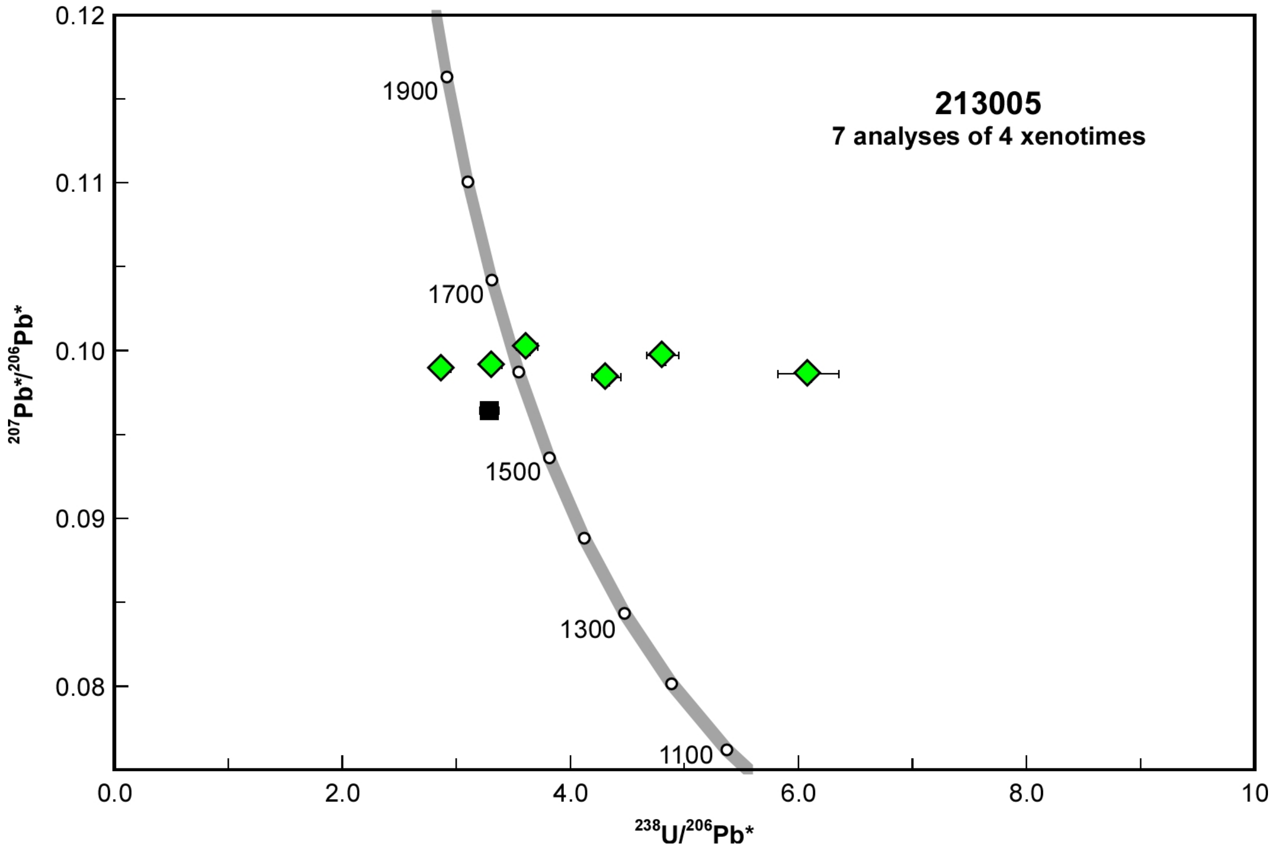

Figure 2. U–Pb analytical data for xenotimes from sample 213005: hydrothermal breccia, John Galt prospect. Green diamonds indicate Group M (hydrothermal xenotimes); black square indicates Group P (radiogenic-Pb loss)

Links

Table 1. Ion microprobe analytical results for xenotimes from sample 213005: hydrothermal breccia, John Galt prospect: 213005.1.Table1.xls

Introduction to geochronology information: Intro_2023.pdf

References

Fielding, IOH, Lu, Y and Morin-Ka, S 2023, 213004.1: hydrothermal breccia, John Galt prospect; Geochronology Record 1902: Geological Survey of Western Australia, <www.dmirs.wa.gov.au/geochron>.

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Recommended reference for this publication

Fielding, IOH, Lu, Y and Morin-Ka, S 2023, 213005.1: hydrothermal breccia, John Galt prospect; Geochronology Record 1903: Geological Survey of Western Australia, WA Geology Online, Explanatory Notes extract viewed 5 July 2023.

<www.dmirs.wa.gov.au/geochron>

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Grid references in this publication refer to the Geocentric Datum of Australia 2020 (GDA20). All locations are quoted to at least the nearest 100 m.

Capitalized names in text refer to standard 1:100 000 map sheets, unless otherwise indicated.

WAROX is GSWA's field observation and sample database. WAROX site IDs have the format 'ABCXXXnnnnnnSS', where ABC = geologist username, XXX = project or map code, nnnnnn = 6 digit site number, and SS = optional alphabetic suffix (maximum 2 characters).

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