

169037: feldspar–quartz porphyry, King Rockhole

Location and sampling

NULLAGINE (SF 51-5), MOUNT EDGAR (2955)
MGA Zone 51, 226170E 7650760N

Sampled on 14 September 2000

The sample was taken from a road cutting on the northern side of the Ripon Hills Road, 3.5 km west-northwest of King Rockhole. Travelling to the west, the site is in the first major road cutting on the hill along the northern side of the Ripon Hills road.

Tectonic unit/relations

The sample is an unfoliated, jointed, black porphyritic rock, with pink and green feldspar and glassy quartz phenocrysts up to 0.5 cm in diameter, from the Bamboo Creek Member of the Hardey Formation, Fortescue Group, Hamersley Basin. The porphyry is underlain by a pale, fiamme-textured volcanoclastic rock containing flattened crystal–vitric tuff fragments, visible in a road cutting 800 m west of the sampling site. The sample is free of obvious dykes and veins, and was dated as a volcanic component of the Hardey Formation (Williams and Bagas, in prep.).

Petrographic description

The principal minerals in this sample are altered feldspar phenocryst (25–30 vol.%), quartz phenocrysts (3 vol.%), altered pyroxene and opaque oxide phenocrysts (1 vol.%), and groundmass (60–65 vol.%), with accessory apatite (trace) and rare zircon (trace). The sample could be dacite but the original nature of the feldspar phenocrysts is uncertain. Low temperature albite–sericite–chlorite–carbonate–quartz–leucoxene alteration is moderately strong, and the rock could be quartz–feldspar porphyritic, acid volcanic or subvolcanic intrusive. Phenocrysts of quartz and feldspar are visible in a grey, siliceous groundmass. In thin section, abundant feldspar phenocrysts, occurring singly or in complex aggregates, to 5 mm in diameter, have been replaced by albite, clouded variously by sericite and carbonate. Quartz phenocrysts are less abundant, with larger phenocrysts, 3 to 5 mm in diameter, having resorption channels filled by groundmass. The smaller quartz phenocrysts, 0.2 to 1.5 mm in diameter, are more rounded, without resorption channels. Rare phenocrysts, possibly of pyroxene, have been altered to quartz, carbonate, chlorite, sericite, and leucoxene, and are up to 1.5 mm long. Scattered opaque oxide microphenocrysts, to 1 mm in diameter, are now leucoxene, with apatite needles in and adjacent to the altered opaque oxide.

Rare zircon occurs in an altered ?pyroxene phenocryst. The groundmass is inequigranular but fine-grained to microcrystalline, with quartz, albite, sericite, and chlorite. Irregular patches of carbonate are scattered, with possible vesicles to 0.8 mm in diameter containing quartz, sericite, and chlorite.

Zircon morphology

The zircons isolated from this sample are typically colourless, pale yellowish-brown or black fragments and whole grains, between $35 \times 50 \mu\text{m}$ and $120 \times 220 \mu\text{m}$ in size, equant to elongate, and euhedral or irregular in shape. Most grains are structureless and fractured, although a minority have remnant internal zonation and fluid inclusions, and many are metamict. Cathodoluminescence images of representative zircons are given in Figure 1.

Analytical details

This sample was analysed on 20 May 2002. The counter deadtime during the analysis session was 32 ns. Thirteen analyses of the CZ3 standard obtained during the analysis session indicated a Pb^*/U calibration uncertainty of 1.29% (1σ). Common-Pb corrections were applied assuming Broken Hill common-Pb isotopic compositions for all analyses.

Results

Seventeen analyses were obtained from 17 zircons. Results are given in Table 1 and shown on a concordia plot in Figure 2.

Interpretation

The analyses are concordant to slightly discordant, with the discordance pattern consistent with a single episode of radiogenic-Pb loss. All 17 analyses have $^{207}\text{Pb}/^{206}\text{Pb}$ ratios defining a single population and indicating a weighted mean $^{207}\text{Pb}/^{206}\text{Pb}$ date of $2766 \pm 7 \text{ Ma}$ ($\chi^2 = 1.27$).

The date of $2766 \pm 7 \text{ Ma}$ indicated by the weighted mean $^{207}\text{Pb}/^{206}\text{Pb}$ ratio of all analyses is interpreted as the age of igneous crystallization of the feldspar–quartz porphyry.

Recommended reference for this publication:

NELSON, D. R., 2004, 169037: feldspar-quartz porphyry, King Rockhole; Geochronology dataset 152; in Compilation of geochronology data, June 2006 update: Western Australia Geological Survey.

Data obtained: 20/05/2002; Data released: 06/12/2004

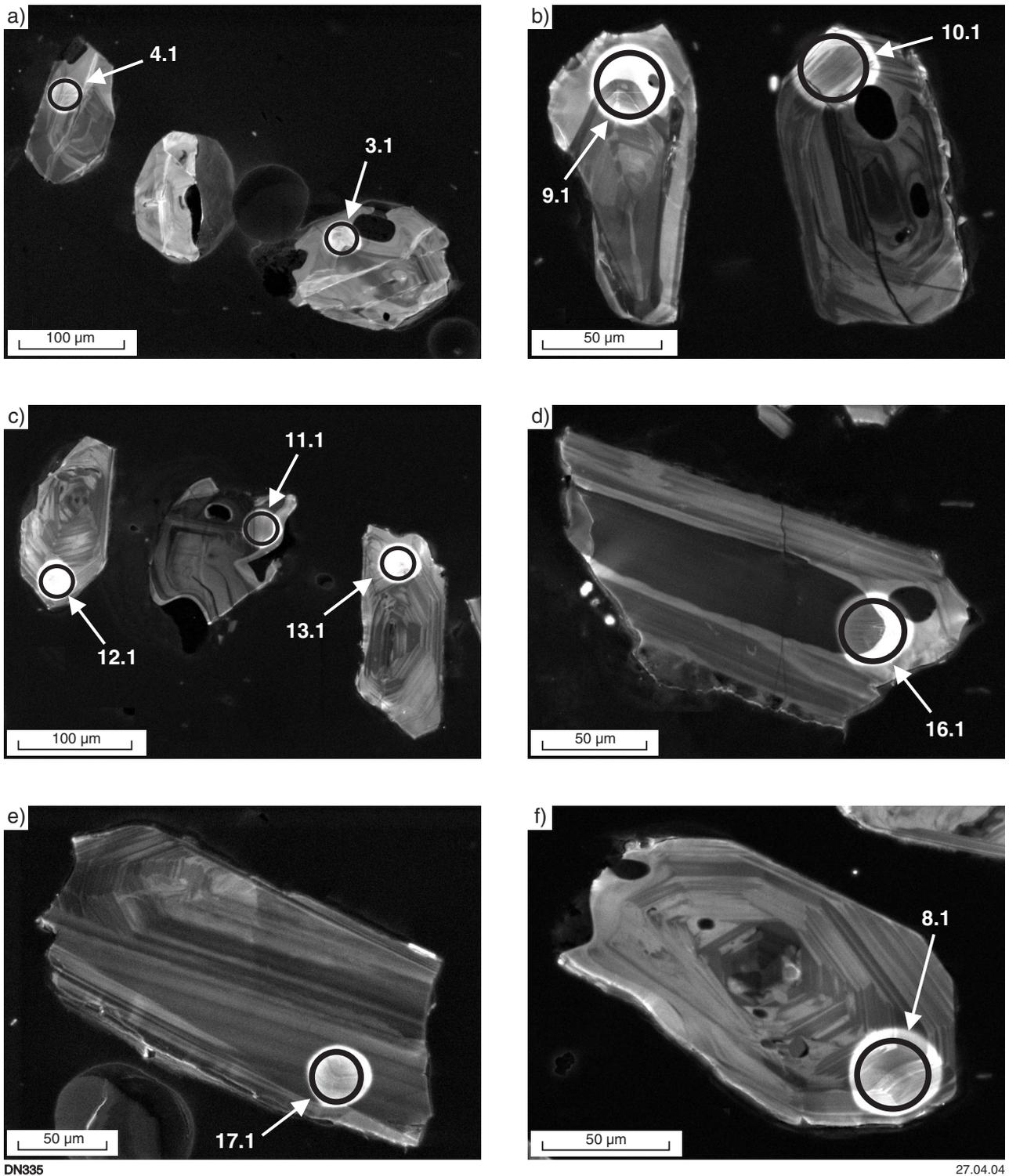


Figure 1. Cathodoluminescence images of representative zircons from sample 169037: feldspar-quartz porphyry, King Rockhole

Table 1. Ion microprobe analytical results for sample 169037: feldspar–quartz porphyry, King Rockhole

Grain spot	U (ppm)	Th (ppm)	Pb (ppm)	f206%	$^{207}\text{Pb}/^{206}\text{Pb}$	$\pm 1\sigma$	$^{208}\text{Pb}/^{206}\text{Pb}$	$\pm 1\sigma$	$^{206}\text{Pb}/^{238}\text{U}$	$\pm 1\sigma$	$^{207}\text{Pb}/^{235}\text{U}$	$\pm 1\sigma$	% concordance	$^{207}\text{Pb}/^{206}\text{Pb}$ Age	$\pm 1\sigma$
1.1	38	56	28	0.253	0.19430	0.00172	0.40779	0.00373	0.5280	0.0077	14.145	0.253	98	2 779	15
2.1	42	51	30	1.180	0.19162	0.00197	0.32407	0.00416	0.5220	0.0076	13.793	0.260	98	2 756	17
3.1	34	43	23	0.288	0.19261	0.00183	0.32854	0.00370	0.4957	0.0072	13.165	0.241	94	2 765	16
4.1	33	43	23	0.386	0.19050	0.00194	0.35276	0.00410	0.5200	0.0076	13.657	0.257	98	2 746	17
5.1	68	115	51	0.064	0.19462	0.00108	0.46318	0.00244	0.5320	0.0074	14.277	0.223	99	2 782	9
6.1	35	45	25	0.924	0.19006	0.00203	0.35066	0.00433	0.5136	0.0075	13.460	0.257	97	2 743	18
7.1	65	83	46	0.311	0.19052	0.00119	0.35119	0.00243	0.5357	0.0074	14.073	0.224	101	2 747	10
8.1	59	78	42	0.170	0.19491	0.00128	0.36591	0.00264	0.5237	0.0073	14.073	0.227	98	2 784	11
9.1	47	57	34	1.062	0.19157	0.00183	0.32730	0.00388	0.5365	0.0077	14.171	0.257	100	2 756	16
10.1	78	104	54	0.192	0.19128	0.00111	0.34636	0.00228	0.5180	0.0071	13.663	0.212	98	2 753	10
11.1	96	80	63	0.094	0.19397	0.00089	0.22615	0.00141	0.5351	0.0073	14.311	0.214	100	2 776	8
12.1	25	27	17	0.851	0.19273	0.00255	0.28799	0.00527	0.5067	0.0077	13.465	0.288	96	2 766	22
13.1	26	28	18	0.273	0.19507	0.00213	0.30373	0.00427	0.5331	0.0081	14.338	0.283	99	2 785	18
14.1	51	73	37	0.250	0.19295	0.00134	0.39732	0.00286	0.5222	0.0074	13.892	0.229	98	2 767	11
15.1	69	75	46	0.179	0.19384	0.00114	0.29524	0.00216	0.5238	0.0072	13.999	0.220	98	2 775	10
16.1	84	118	61	0.442	0.19235	0.00108	0.38392	0.00229	0.5290	0.0072	14.031	0.216	99	2 762	9
17.1	87	145	65	0.225	0.19133	0.00102	0.45335	0.00231	0.5232	0.0071	13.802	0.211	99	2 754	9

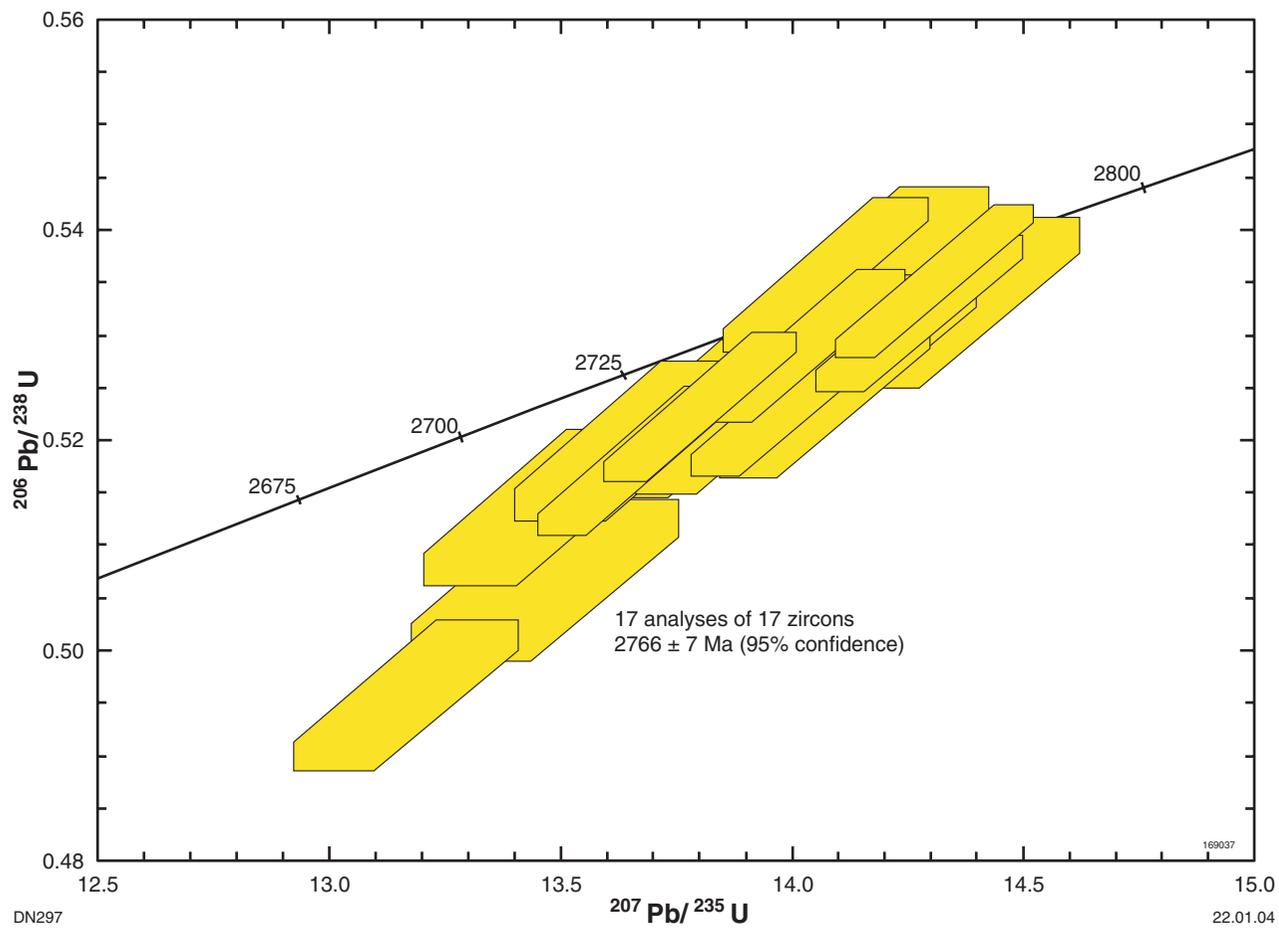


Figure 2. Concordia plot for sample 169037: feldspar-quartz porphyry, King Rockhole