

# 114358: porphyritic rhyolite, south of Mount Sholl

## Location and sampling

DAMPIER and BARROW ISLAND (SF 50–1, 2)

116°55'20"E, 20°59'45"S

Sampled during 1994

The sampling site is located about 6 km south of Mount Sholl.

## Tectonic unit/relations

A rhyolite from a predominantly felsic pyroclastic unit of the Sholl succession. This succession is unconformably overlain by c. 2770 Ma rocks of the Fortescue Group.

## Petrographic description

This sample consists of phenocrysts and glomerophenocrysts (7–10 vol.%) of quartz (2–3 vol.%), sodic plagioclase (5–7 vol.%), epidote (5–7 vol.%) and chlorite (2–3 vol.%) pseudomorphs after ferromagnesian minerals (1–2 vol.%, up to 1.5–2.0 mm in length) set within an aphanitic groundmass (averaging 0.15 mm) of ovoid intergrowths of radiating feldspar and quartz, feldspar microlites, anhedral interstitial quartz and chlorite, subhedral granular epidote, titanite and accessory phases. Igneous textures are well preserved, and the rock exhibits a non-fragmental, porphyritic and glomerocrystic texture suggestive of emplacement as a high-level intrusive rock or lava. Spherulitic textures preserved in the groundmass imply an originally glassy groundmass. Plagioclase phenocrysts occur as euhedral to subhedral laths, commonly twinned on the Carlsbad twin law or, to a lesser extent, show polysynthetic albite twinning. Crystals are unzoned, biaxial positive with anorthite contents between 8 and 10 mol.% An (i.e. albite). Quartz phenocrysts average 0.5–1.5 mm in diameter, and exhibit the weakly embayed, equant bipyramidal habit typical of igneous quartz phenocrysts. Original ?pyroxene phenocrysts are now entirely pseudomorphed by aggregates of fine-grained epidote and chlorite. They form squat, prismatic phenocrysts between 0.2 and 0.8 mm in length. Their pseudomorphs may contain relatively high concentrations of high relief, highly birefringent accessory minerals (generally up to 15 mm in size). Apatite occurs as minor inclusions in most phenocryst phases. The effects of subsequent hydrothermal alteration or metamorphism on this rock appear to be minor, and are most notable in the formation of epidote,

chlorite, ?titanite and sericite in the groundmass, and as pseudomorphs of original igneous minerals. Epidote also occurs as granular, subhedral to prismatic grains intergrown with chlorite and quartz in scattered, coarser-grained domains of the groundmass that may represent irregular-shaped amygdales. Chlorite forms grains less than 0.1 mm in size that are interstitial to, and outline spherulites in the groundmass. A dark brown mineral having very high relief and birefringence, identified tentatively as titanite, appears to pseudomorph prismatic magmatic, 0.5 to 1.0 mm long phenocrysts of unknown origin, and is therefore probably secondary. Zircon, ranging in size from 15 to 75  $\mu\text{m}$  in length, forms an ubiquitous accessory phase in the groundmass and as inclusions in phenocryst phases. The larger grains are generally anhedral to subhedral, whereas the smaller crystals are generally euhedral in habit. The sample is a sparsely feldspar–quartz–phyric rhyolite or rhyolite porphyry.

## **Zircon morphology**

Most of the zircons isolated from this sample are colourless to light pink, generally between  $75 \times 120 \mu\text{m}$ , euhedral and well-preserved. Igneous zoning cannot be distinguished, but many crystals contain fluid and mineral inclusions.

## **Analytical details**

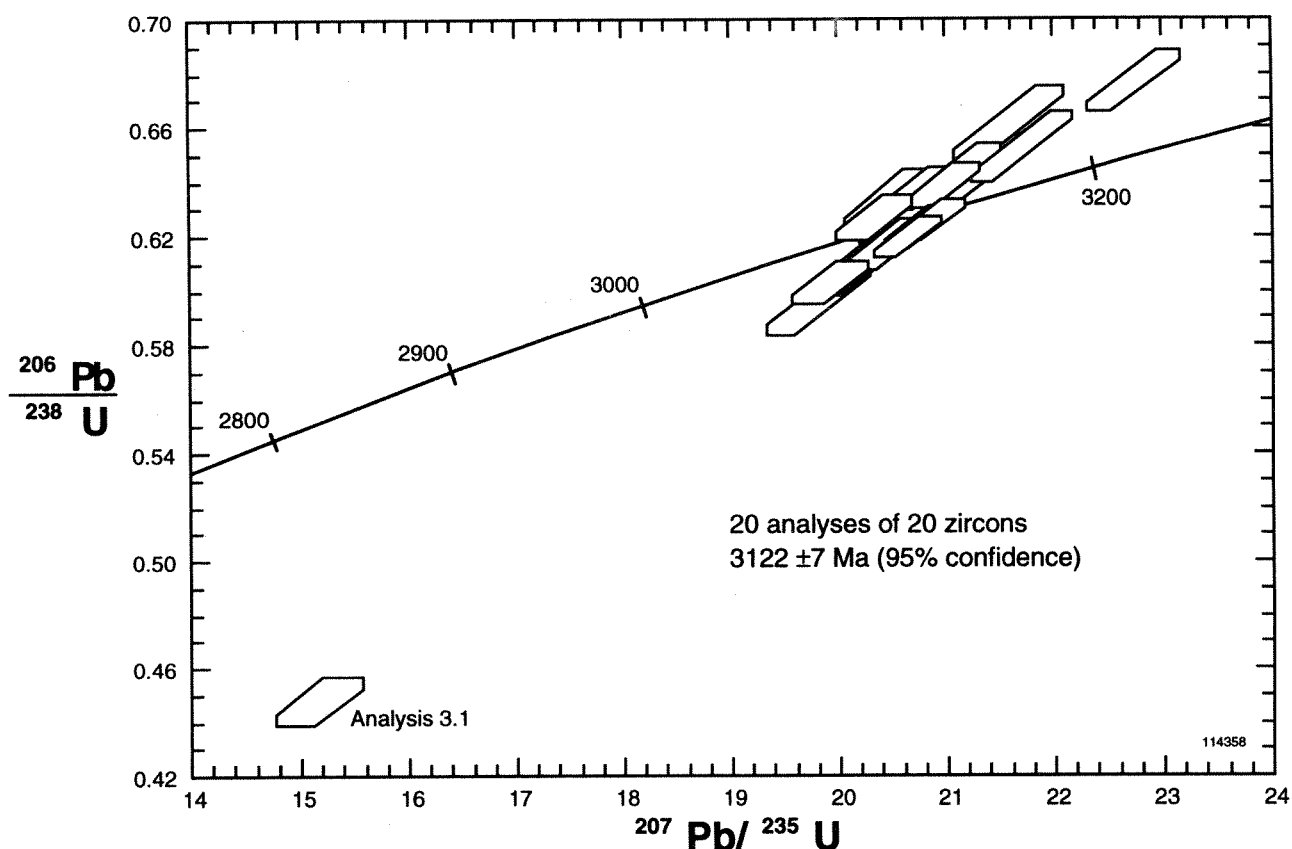
This sample was analysed on 4 January 1995. The counter deadtime was 32 ns. Six analyses of the CZ3 standard were obtained during the analysis session and indicated that the  $\text{Pb}^*/\text{U}$  calibration was unstable. The analyses were therefore divided into four batches. For batch 1 (consisting of two standard analyses and analyses 1.1 to 3.1), the calibration error was 1.51 (1 $\sigma$ %). For batch 2 (consisting of two standard analyses and analyses 4.1 to 8.1), the calibration error was 1.84 (1 $\sigma$ %). For batch 3 (consisting of two standard analyses and analyses 9.1 to 12.1), an error in  $\text{Pb}^*/\text{U}$  of 1.51 (1 $\sigma$ %) was determined, and for batch 4 (consisting of three standard analyses and analyses 13.1 to 20.1), an  $\text{Pb}^*/\text{U}$  error of 0.211 (1 $\sigma$ %) was determined. An error in  $\text{Pb}^*/\text{U}$  of 1.0 (1 $\sigma$ %) was assumed for analyses belonging to batch 4.

## **Results**

Twenty analyses were obtained from 20 zircons. Results are given in Table 31 and shown on a concordia plot in Figure 33.

**Table 31. Ion microprobe analytical results for sample 114358: porphyritic rhyolite, south of Mount Sholl**

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	91	50	68	0.304	0.23481	0.00198	0.14243	0.00291	0.6317	0.0105	20.453	0.400	102	3 085	13
2.1	85	48	69	0.183	0.24463	0.00181	0.15324	0.00232	0.6745	0.0112	22.752	0.432	105	3 150	12
3.1	75	41	41	0.612	0.24577	0.00410	0.15280	0.00601	0.4476	0.0087	15.167	0.410	76	3 158	26
4.1	91	47	64	0.033	0.24172	0.00229	0.13966	0.00226	0.5947	0.0126	19.822	0.480	96	3 131	15
5.1	94	49	71	0.014	0.24010	0.00172	0.14175	0.00190	0.6304	0.0129	20.870	0.469	101	3 121	11
6.1	78	26	58	0.223	0.24064	0.00230	0.08068	0.00299	0.6412	0.0134	21.274	0.512	102	3 124	15
7.1	74	34	53	0.172	0.24097	0.00242	0.12219	0.00305	0.6092	0.0129	20.241	0.496	98	3 126	16
8.1	73	35	57	0.132	0.23764	0.00207	0.12687	0.00260	0.6591	0.0138	21.595	0.509	105	3 104	14
9.1	75	48	58	0.204	0.23863	0.00192	0.16603	0.00267	0.6394	0.0127	21.039	0.470	102	3 111	13
10.1	202	224	163	0.077	0.24018	0.00114	0.27819	0.00172	0.6157	0.0117	20.389	0.410	99	3 121	8
11.1	68	33	50	0.389	0.24130	0.00228	0.12158	0.00326	0.6188	0.0125	20.587	0.481	99	3 129	15
12.1	98	52	76	0.174	0.24200	0.00176	0.14121	0.00228	0.6506	0.0128	21.709	0.475	103	3 133	12
13.1	84	45	63	0.357	0.23836	0.00205	0.13567	0.00312	0.6323	0.0079	20.780	0.333	102	3 109	14
14.1	82	51	63	0.357	0.23708	0.00205	0.15984	0.00313	0.6354	0.0079	20.770	0.334	102	3 100	14
15.1	83	40	62	0.217	0.23891	0.00195	0.11888	0.00258	0.6367	0.0080	20.972	0.332	102	3 113	13
16.1	68	26	47	0.339	0.24040	0.00249	0.09233	0.00326	0.6012	0.0080	19.929	0.355	97	3 123	16
17.1	90	48	67	0.174	0.24215	0.00186	0.14124	0.00234	0.6212	0.0076	20.741	0.317	99	3 134	12
18.1	65	26	48	0.443	0.23609	0.00236	0.09760	0.00336	0.6249	0.0082	20.340	0.356	101	3 094	16
19.1	97	63	74	0.258	0.24246	0.00184	0.16968	0.00260	0.6240	0.0076	20.861	0.316	100	3 136	12
20.1	95	56	71	0.108	0.24221	0.00180	0.15438	0.00230	0.6180	0.0076	20.639	0.312	99	3 135	12



**Figure 33. Concordia plot for sample 114358: porphyritic rhyolite, south of Mount Sholl**

## Interpretation

All analyses, apart from discordant analysis 3.1, plot within error of or close to the concordia curve and have  $^{207}\text{Pb}/^{206}\text{Pb}$  ratios close to a single value (chi-squared = 1.50) corresponding to an age of  $3122 \pm 7$  Ma. This is interpreted as the time of igneous crystallization of the rhyolite.

### STRATIGRAPHIC REFERENCE:

HICKMAN, A. H., 1997, A revision of the stratigraphy of Archaean greenstone successions in the Roebourne–Whundo area, west Pilbara: Western Australia Geological Survey, Annual Review 1996–97, p. 76–81.

### Recommended reference for this publication:

NELSON, D. R., 1997, 114358: porphyritic rhyolite, south of Mount Sholl; in Compilation of SHRIMP U–Pb zircon geochronology data, 1996: Western Australia Geological Survey, Record 1997/2, p. 134–137.

OR

NELSON, D. R., 1997, 114358: porphyritic rhyolite, south of Mount Sholl; Geochronology dataset 480; in Compilation of geochronology data, June 2006 update: Western Australia Geological Survey.

Data obtained: 04/01/1996; Data released: 21/08/1997