118975: porphyritic rhyolite, Mount Regal

Location and sampling

DAMPIER and BARROW ISLAND (SF 50–1, 2) AMG Zone 50, 474900E, 7697900N

Sampled on 11 September 1995

The sampling site is located 1 km east of the summit of Mount Regal.

Tectonic unit/relations

The sample is from a small conformable lens of dacite stratigraphically below a sequence of chert and carbonate. The dacite lens can be traced to the south for 100 m, and lithologically similar dacites occur about 1.5 km away at the same stratigraphic level. The greenstone succession underlying this unit has been intruded by the Karratha Granite. To the south and southwest, the entire Mount Regal succession is truncated by the Sholl Shear Zone.

Petrographic description

The principal minerals present are potash feldspar and quartz, with abundant tremolite and minor carbonate and prehnite and accessory amounts of chlorite, titanite, opaque, muscovite, microcline, leucoxene, apatite and zircon. This is a slightly deformed porphyritic rock composed of quartz phenocrysts embedded in a fine-grained mosaic consisting of equal proportions of quartz and potash feldspar, with minor interstitial, penetrative, foliated muscovite and chlorite/leucoxene after (?)biotite plus traces of microcline. The rock is also spotted with aggregates of xenomorphic, commonly skeletal, near colourless amphibole (?tremolite) porphyroblasts, intimately intergrown with quartz, epidote, potash feldspar (including microcline) and carbonate. These are stretched out along the direction of the muscovite–chlorite foliation and could represent metamorphically altered feldspar and/or mafic phenocrysts. Carbonate, chlorite and epidote have locally partly replaced the amphibole. The quartz phenocrysts are strained and partly to completely recrystallized. The grain outlines are gently convex or concave and finely sutured by the groundmass mosaic. Titanite anhedra are disseminated throughout, usually associated with the amphibole-bearing aggregates and locally containing opaque cores. A few prismatic apatite crystals are also embedded in the groundmass. The rock is cut by a few late fracture films of carbonate and prehnite. It has a

moderately well-preserved porphyritic texture, but has suffered some deformation and development of a schistose fabric. The colourless to near colourless amphibole is clearly metamorphic. The presence of epidote and prehnite suggests prehnite–pumpellyite facies grade of burial metamorphism. Retrograde propylitic alteration has also occurred. Pleochroic haloes occurring around a few (?)metamict zircon euhedra up to 0.05 mm long are locked in the amphibole.

Zircon morphology

The zircons extracted from this sample are euhedral to subhedral, typically 300 × 120 μm, and light pink-brown to deep purple-brown. Igneous zonation can be discerned in many crystals. Small mineral and fluid inclusions are common.

Analytical details

This sample was analysed on 21 July and 22 August 1996. The counter deadtime was 32 ns. Six analyses of the CZ3 standard obtained during the session indicated a Pb^*/U calibration error of 2.03 (1σ%). Common-Pb corrections were made assuming Broken Hill common-Pb isotopic compositions for all unknown analyses with the exception of analysis 2.1, for which isotopic compositions determined using the method of Cumming and Richards (1975) were assumed.

Results

Nineteen analyses were obtained from 19 zircons. Results are given in Table 36 and shown on a concordia plot in Figure 38.

Interpretation

Eleven generally concordant analyses of 11 zircons indicate a mean $^{207}Pb/^{206}Pb$ age of 3251 ± 6 Ma (chi-squared = 1.29). This is interpreted as the time of igneous crystallization of the dacite. A further three concordant analyses (7.1, 13.1 and 17.1) indicate higher $^{207}Pb/^{206}Pb$ ages and are interpreted to be of xenocrysts. The remaining analyses (1.1, 4.1, 9.1, 16.1 and 18.1) are interpreted to be of sites that have lost radiogenic Pb.

Table 36. Ion microprobe analytical results for sample 118975: porphyritic rhyolite, Mount Regal

Grain .spot	*U (ppm)*	*Th (ppm)*	*Pb (ppm)*	*f206%*	$^{207}Pb/^{206}Pb$	± 1σ	$^{208}Pb/^{206}Pb$	± 1σ	$^{206}Pb/^{238}U$	± 1σ	$^{207}Pb/^{235}U$	± 1σ	*% concordance*	$^{207}Pb/^{206}Pb$ *Age*	± 1σ
1.1	258	203	196	0.737	0.25473	0.00125	0.19186	0.00205	0.5985	0.0125	21.022	0.462	94	3 214	8
2.1	440	446	365	1.897	0.25951	0.00123	0.20963	0.00233	0.6174	0.0127	22.092	0.480	96	3 244	7
3.1	168	83	136	1.250	0.26044	0.00170	0.11369	0.00289	0.6585	0.0139	23.647	0.539	100	3 249	10
4.1	315	238	206	1.372	0.24496	0.00137	0.18738	0.00249	0.5083	0.0105	17.166	0.378	84	3 152	9
5.1	456	445	398	0.481	0.25952	0.00083	0.25321	0.00135	0.6608	0.0136	23.646	0.501	101	3 244	5
6.1	144	76	117	1.434	0.26015	0.00186	0.12379	0.00325	0.6495	0.0138	23.297	0.541	99	3 248	11
7.1	190	93	157	0.785	0.26397	0.00143	0.12498	0.00227	0.6743	0.0141	24.542	0.547	102	3 271	9
8.1	339	266	274	0.587	0.25937	0.00102	0.19837	0.00160	0.6320	0.0131	22.601	0.486	97	3 243	6
9.1	271	141	204	0.818	0.25558	0.00122	0.12589	0.00193	0.6163	0.0128	21.719	0.476	96	3 220	8
10.1	299	210	246	0.782	0.26272	0.00114	0.17471	0.00184	0.6483	0.0134	23.483	0.510	99	3 263	7
11.1	157	92	127	1.100	0.26418	0.00172	0.14710	0.00290	0.6446	0.0136	23.480	0.537	98	3 272	10
12.1	204	142	171	0.720	0.26184	0.00131	0.17688	0.00210	0.6606	0.0138	23.848	0.526	100	3 258	8
13.1	370	272	306	0.724	0.26312	0.00101	0.18610	0.00164	0.6480	0.0134	23.508	0.505	99	3 265	6
14.1	251	135	203	0.891	0.26068	0.00123	0.12390	0.00192	0.6604	0.0137	23.735	0.520	101	3 251	7
15.1	198	104	161	0.977	0.26135	0.00144	0.12671	0.00235	0.6620	0.0138	23.855	0.532	101	3 255	9
16.1	264	186	218	0.945	0.25519	0.00121	0.18604	0.00206	0.6471	0.0134	22.767	0.498	100	3 217	7
17.1	261	134	211	0.739	0.26321	0.00117	0.12589	0.00179	0.6623	0.0138	24.036	0.523	100	3 266	7
18.1	532	369	346	0.519	0.23237	0.00081	0.17912	0.00130	0.5266	0.0108	16.870	0.358	89	3 068	6
19.1	140	83	113	1.007	0.26263	0.00175	0.15015	0.00292	0.6416	0.0135	23.232	0.532	98	3 263	10

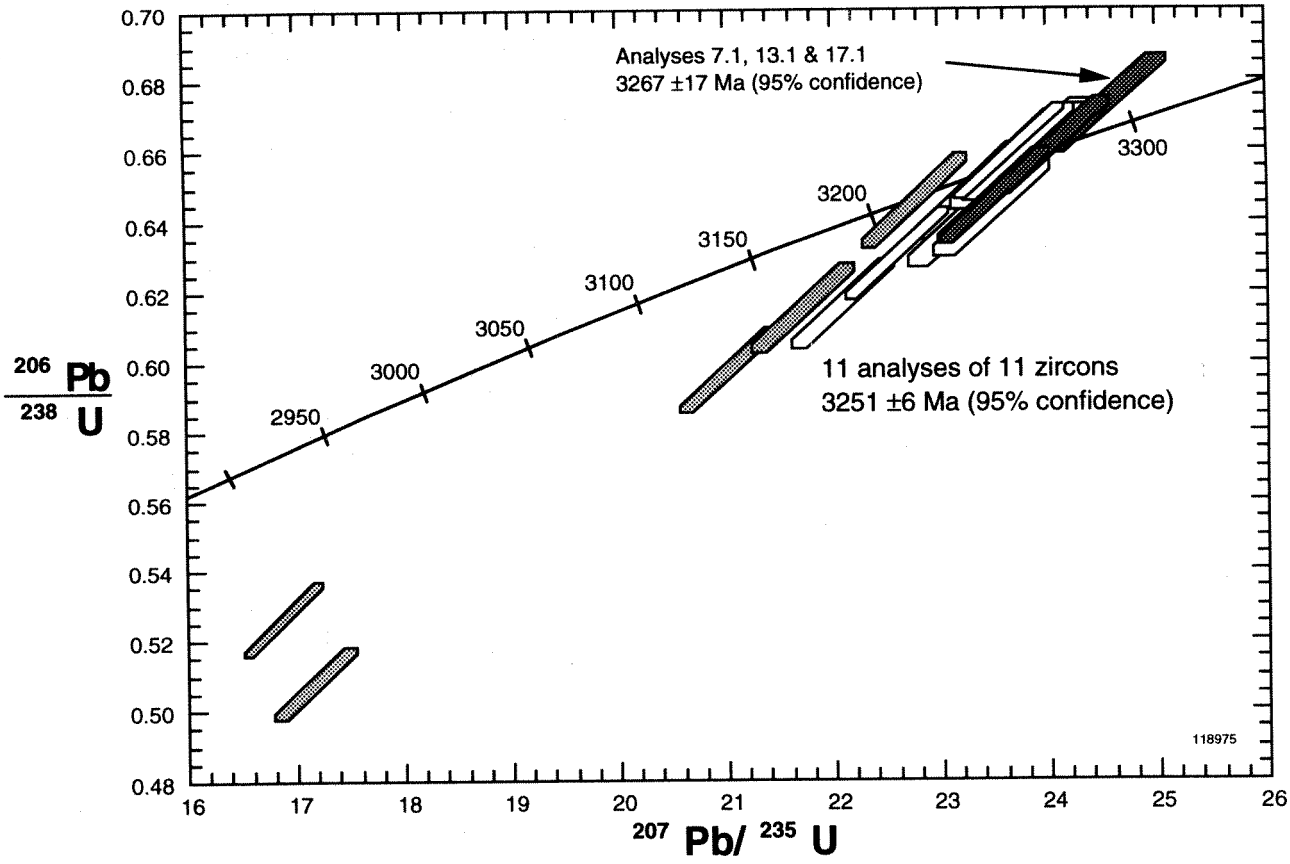

Figure 38. Concordia plot for sample 118975: porphyritic rhyolite, Mount Regal

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, 118975: porphyritic rhyolite, Mount Regal; in Compilation of SHRIMP U–Pb zircon geochronology data, 1996: Western Australia Geological Survey, Record 1997/2, p. 154–157.
OR
NELSON, D. R., 1997, 118975: porphyritic rhyolite, Mount Regal; Geochronology dataset 432; in Compilation of geochronology data, June 2006 update: Western Australia Geological Survey.

Data obtained: 22/08/1996; Data released: 21/08/1997