

142830: volcanigenic sedimentary rock, Mount Ada

Location and sampling

ROEBOURNE (SF 50-3)

AMG Zone 50, 516850E 7686620N

Sampled on 22 September 1996

The sample was taken from an approximately 20 m thick, orange, well-bedded horizon that is interbedded with darker banded iron-formations of the Cleaverville Formation (Hickman, 1997). The sampling site is located on a prominent rocky outcrop on a steep ridge.

Tectonic unit/relations

The sample is from a volcanigenic sedimentary rock from a succession of banded iron-formation and clastic sedimentary rocks that is tentatively correlated with the Cleaverville Formation (Hickman, 1997). This succession unconformably underlies the Whim Creek Group (Hickman, 1997) and the Fortescue Group and is truncated to the north by the Sholl Shear Zone.

Petrographic description

This sample is of a quartz-rich sandstone, possibly from a volcanic terrane. The dominant phase, constituting about 90 vol. % of the rock, is quartz, in rounded, equant grains, varying little in size from 0.01 mm. A second phase of quartz grains is distinguished by the greater size of the grains, which vary little from about 1 mm in diameter. These are sparse, there are about six in the area of the section. Minute elongate grains of sericite form a weaving trail around the groundmass quartz grains. Sericite constitutes 5–7 vol. % of the rock. Limonitic material follows the sericite forming a reticulate pattern around the grains of quartz. Opaque material, apparently limonite after magnetite forms both minute groundmass grains and coarse, euhedral grains 1 mm across. These opaques constitute no more than 5 vol. % of the rock. There is a very small amount of very fine chlorite. One grain of an accessory mineral was seen, a geniculate twin of rutile, of 0.04 mm in length. The fabric of the rock is dominated by 0.01 mm grains of quartz. The few coarse quartz grains are set in this groundmass. The groundmass quartz grains are equant but angular in detail due to interaction with the sericite. An increased abundance of sericite in the margins of both the groundmass and inset quartz grains suggests that the margins of the quartz grains have not been stable. That is, there has been overgrowth on the quartz grains and, implicitly, perhaps solution. The coarse insets of quartz are strongly rounded. There is little, if any, foliation in the rock. There is no clear evidence for a volcanic origin to this rock. The only positive feature in favour of a volcanic origin is the bimodal quartz size distribution, as the coarser quartz may have been phenocrysts. The rock is a sandstone, probably derived from a porphyritic volcanic source.

Zircon morphology

The zircons extracted from this sample are typically irregular euhedral grains and grain fragments that are $120 \times 100 \mu\text{m}$ in size, structureless, and light brown to yellow-brown.

Analytical details

This sample was analysed on 31 April 1997. The counter deadtime was 32 ns. Ten analyses of the CZ3 standard obtained during the analysis session indicated a Pb^*/U calibration error of 0.868

Table 18. Ion microprobe analytical results for sample 142830: volcanigenic sedimentary rock, Mount Ada

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	149	133	109	0.049	0.22458	0.00077	0.24398	0.00121	0.5793	0.0054	17.939	0.185	98	3 014	6
2.1	116	84	85	0.031	0.22669	0.00085	0.19462	0.00116	0.5995	0.0057	18.736	0.198	100	3 029	6
3.1	255	188	172	0.051	0.22537	0.00061	0.20313	0.00083	0.5488	0.0050	17.055	0.167	93	3 019	4
4.1	101	72	74	0.082	0.22664	0.00102	0.19056	0.00144	0.6004	0.0059	18.763	0.212	100	3 028	7
5.1	230	213	170	0.060	0.22677	0.00067	0.25327	0.00100	0.5794	0.0053	18.117	0.182	97	3 029	5
6.1	202	167	147	0.078	0.22400	0.00072	0.22363	0.00105	0.5824	0.0054	17.989	0.184	98	3 010	5
7.1	276	182	193	0.058	0.22469	0.00061	0.17313	0.00077	0.5796	0.0053	17.956	0.176	98	3 015	4
8.1	295	195	202	0.026	0.22487	0.00056	0.18022	0.00070	0.5645	0.0051	17.501	0.170	96	3 016	4
9.1	162	139	117	0.067	0.22489	0.00082	0.23293	0.00120	0.5717	0.0054	17.729	0.187	97	3 016	6
10.1	186	135	139	0.029	0.22650	0.00076	0.19478	0.00102	0.6077	0.0057	18.978	0.196	101	3 027	5
11.1	176	148	129	0.109	0.22415	0.00081	0.22514	0.00118	0.5845	0.0055	18.064	0.189	99	3 011	6
12.1	295	293	217	0.024	0.22542	0.00070	0.27018	0.00104	0.5714	0.0053	17.760	0.180	96	3 020	5
13.1	209	174	150	0.041	0.22494	0.00074	0.22532	0.00104	0.5730	0.0054	17.770	0.183	97	3 016	5
14.1	182	176	137	0.056	0.22495	0.00075	0.26259	0.00116	0.5856	0.0055	18.164	0.187	99	3 016	5
15.1	127	91	92	0.120	0.22496	0.00093	0.19190	0.00127	0.5922	0.0057	18.368	0.201	99	3 017	7
16.1	134	105	98	0.085	0.22450	0.00092	0.20722	0.00135	0.5929	0.0057	18.353	0.200	100	3 013	7
17.1	238	210	177	0.040	0.22563	0.00066	0.24032	0.00097	0.5884	0.0054	18.304	0.183	99	3 021	5
18.1	236	224	174	0.112	0.22528	0.00069	0.25502	0.00109	0.5756	0.0053	17.879	0.180	97	3 019	5
19.1	376	274	220	0.109	0.22676	0.00060	0.20499	0.00086	0.4735	0.0043	14.803	0.144	82	3 029	4
20.1	293	221	193	0.145	0.22495	0.00063	0.20157	0.00091	0.5354	0.0049	16.605	0.164	92	3 016	5
21.1	432	210	148	0.211	0.22405	0.00072	0.14619	0.00100	0.2891	0.0026	8.932	0.088	54	3 010	5
22.1	179	157	130	0.064	0.22389	0.00092	0.23555	0.00136	0.5775	0.0055	17.828	0.194	98	3 009	7

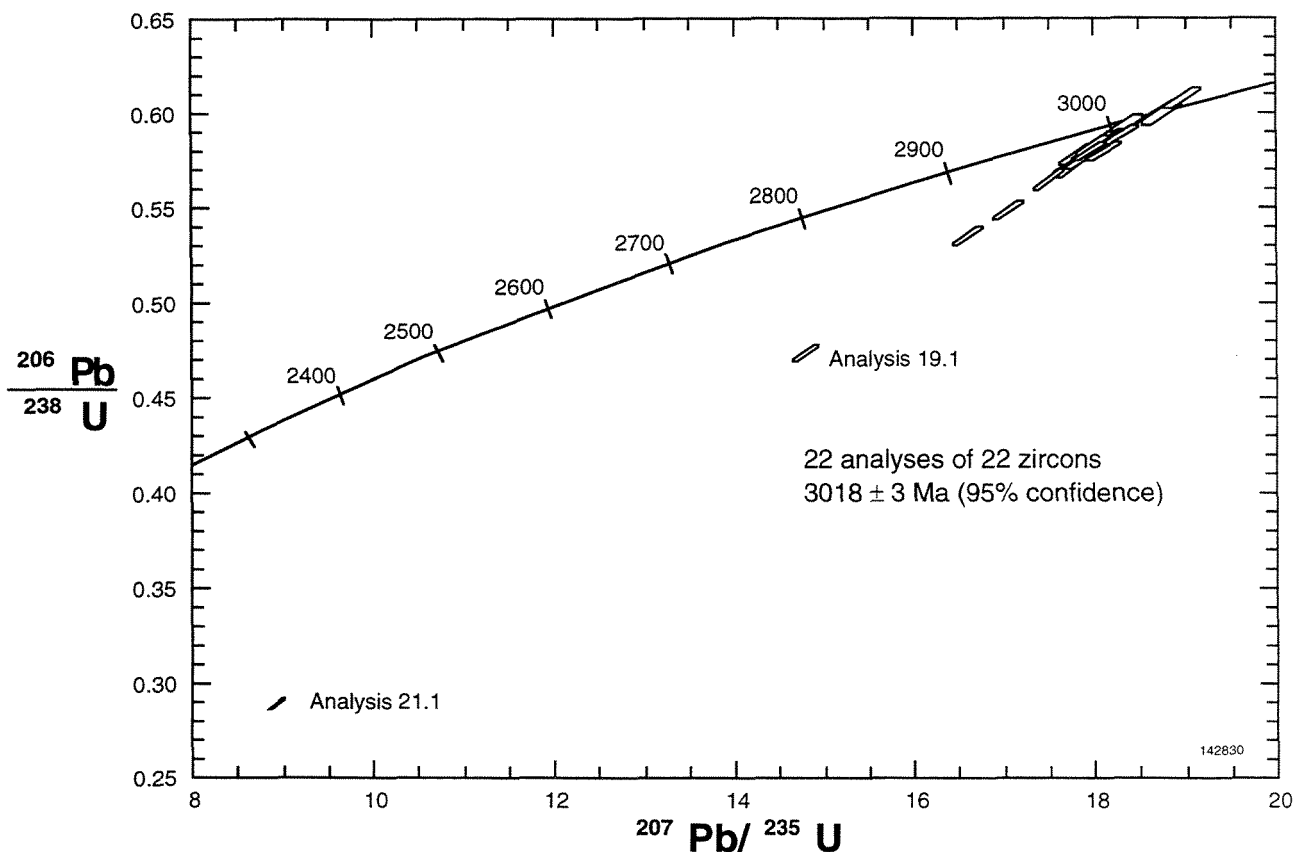


Figure 19. Concordia plot for sample 142830: volcanigenic sedimentary rock, Mount Ada

(1 σ %). Common-Pb corrections were made assuming the Pb isotopic compositions of Broken Hill common Pb for all unknown analyses.

Results

Twenty-two analyses were obtained from 22 zircons. Results are given in Table 18 and shown on a concordia plot in Figure 19.

Interpretation

Although some analyses are discordant, all analyses indicate a weighted mean $^{207}\text{Pb}/^{206}\text{Pb}$ ratio corresponding to a date of 3018 ± 3 Ma (chi-squared = 1.49). This is interpreted as the time of igneous crystallization of the volcanic component within the rock and is considered to approximate the time of deposition of the volcanigenic sediment.

STRATIGRAPHIC REFERENCE:

HICKMAN, A. H., 2002, Geology of the Roebourne 1:100 000 sheet: Western Australia Geological Survey, 1:100 000 Geological Series Explanatory Notes.

Recommended reference for this publication:

NELSON, D. R., 1998, 142830: volcanigenic sedimentary rock, Mount Ada; in Compilation of SHRIMP U–Pb zircon geochronology data, 1997: Western Australia Geological Survey, Record 1998/2, p. 63–65.

OR

NELSON, D. R., 1998, 142830: volcanigenic sedimentary rock, Mount Ada; Geochronology dataset 390; in Compilation of geochronology data, June 2006 update: Western Australia Geological Survey.

Data obtained: 01/05/1997; Data released: 25/06/1998