

182465: metagabbro, Splinter prospect

(*Esperance Supersuite, Albany–Fraser Orogen*)

Location and sampling

NORSEMAN (SI 51-2), MOUNT ANDREW (3432)
MGA Zone 51, 479300E 6351995N

Sampled on 16 August 2010

This sample was collected from the 36.7 – 36.8 m depth interval of diamond drillcore NSD002, an exploration hole drilled in 2006 at the Splinter prospect by Azure Minerals Ltd. The drillhole is located about 59 km east-northeast of Dingo Rock, 44.2 km north of Mount Beaumont, and 35.9 km south-southwest of Mount Andrew.

Tectonic unit/rerelations

The unit sampled is a metagabbro assigned to the Esperance Supersuite (Smithies et al., 2015). The 1200–1140 Ma emplacement of the Esperance Supersuite coincided with Stage II of the Albany–Fraser Orogeny (Spaggiari et al., 2014). Intrusions of the Esperance Supersuite are generally lower in metamorphic grade, and less pervasively deformed, than those of the Recherche Supersuite. Esperance Supersuite intrusions locally exhibit magmatic fabrics and an overprinting weak to mylonitic foliation, and some examples are strongly magnetic and distinctive in aeromagnetic images (Smithies et al., 2015; Spaggiari et al., 2014). The metagabbro sampled (Fig. 1) is interlayered with mafic to intermediate gneiss, similar to that in the NSD001 drillcore, located about 1.0 km to the southwest. Samples from drillcore NSD001 include a granodiorite gneiss that yielded a crystallization age of 1666 ± 6 Ma (GSA 182464, Wingate et al., 2016c), and a garnetiferous metagabbro that yielded a crystallization age of 1276 ± 6 Ma (GSA 182462, Wingate et al., 2016b). Zircons in these two samples are overgrown by metamorphic rims that provided dates of 1168 ± 6 and 1163 ± 17 Ma, respectively, interpreted as ages of high-grade metamorphism. A metatonalite from higher in NSD001 yielded a crystallization age of 1156 ± 5 Ma (GSA 182459, Wingate et al., 2016a).

Petrographic description

The sample is a metagabbro (Fig. 1), containing about 30% amphibole, 25% plagioclase, 20% orthopyroxene, 10% clinopyroxene, 10% biotite and opaque oxide

minerals, 3% garnet, and minor quartz, chlorite, and serpentine. Amphibole is equigranular, fine grained (up to 2 mm across), and brown-green. Plagioclase (andesine, An_{30-35}) is transparent, and albite-twinned. Orthopyroxene (hypersthene, parallel extinction, large negative 2V optic angle) is fine grained, granular, and partially replaced by amphibole. Clinopyroxene (augite) forms fine- to medium-grained phenocrysts displaying distinct cleavage and extensive marginal replacement by brown-green amphibole and veining by serpentine and chlorite. Garnet is anhedral, up to several millimetres across, and poikiloblastic. The paragenetic sequence indicates a primary augite–hypersthene–plagioclase assemblage replaced by amphibole and garnet during amphibolite facies metamorphism.

Zircon morphology

Zircons isolated from this sample are colourless, and anhedral to subhedral. The crystals are up to 200 μ m long, and equant to elongate, with aspect ratios up to 4:1. In cathodoluminescence (CL) images, most zircons exhibit weakly developed concentric zoning, and some crystals appear to contain older cores. A CL image of representative zircons is shown in Figure 2.

Analytical details

This sample was analysed on 15–16 November 2013, using SHRIMP-B. Eleven analyses of the BR266 standard were obtained during the session, of which eight analyses indicated an external spot-to-spot (reproducibility) uncertainty of 0.68% (1σ) and a $^{238}\text{U}/^{206}\text{Pb}^*$ calibration uncertainty of 0.32% (1σ). Calibration uncertainties are included in the errors of $^{238}\text{U}/^{206}\text{Pb}^*$ ratios and dates listed in Table 1. Common-Pb corrections were applied to all analyses using contemporaneous isotopic compositions determined according to the model of Stacey and Kramers (1975).

Results

Twenty-two analyses were obtained from 21 zircons. Results are listed in Table 1, and shown in a concordia diagram (Fig. 3).



Figure 1. Drillcore photograph for sample 182465: metagabbro, Splinter prospect.

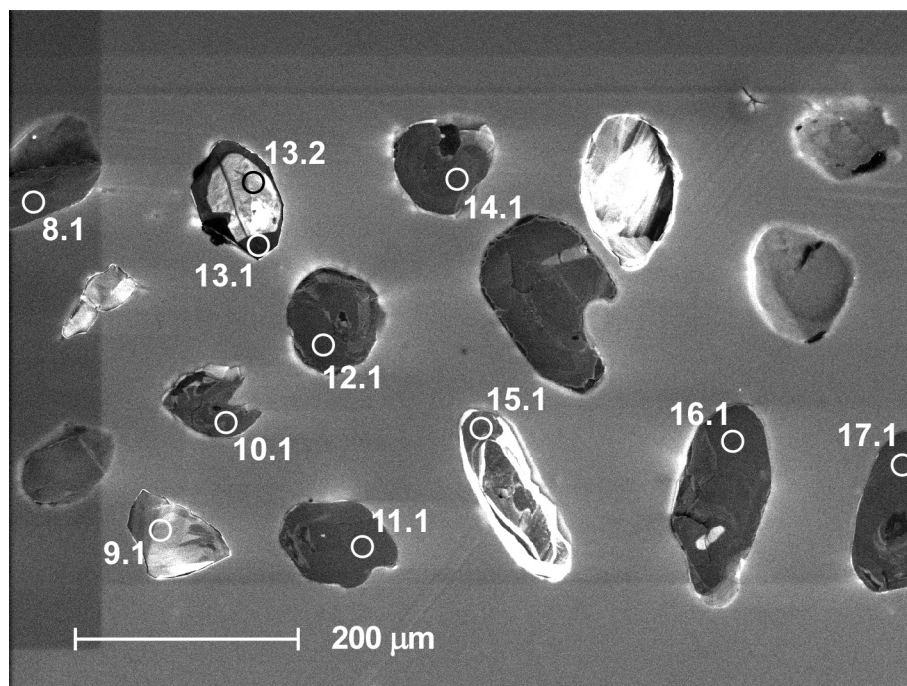


Figure 2. Cathodoluminescence image of representative zircons from sample 182465: metagabbro, Splinter prospect. Numbered circles indicate the approximate locations of analysis sites.

Table 1. Ion microprobe analytical results for zircons from sample 182465: metagabbro, Splinter prospect

Group ID	Spot no.	Grain. spot	^{238}U (ppm)	^{232}Th (ppm)	$\frac{^{232}\text{Th}}{^{238}\text{U}}$	f_{204} (%)	$^{238}\text{U}/^{206}\text{Pb} \pm 1\sigma$	$^{207}\text{Pb}/^{206}\text{Pb} \pm 1\sigma$	$^{238}\text{U}/^{206}\text{Pb}^* \pm 1\sigma$	$^{207}\text{Pb}^*/^{206}\text{Pb}^* \pm 1\sigma$	$^{238}\text{U}/^{206}\text{Pb}^*$ date (Ma) $\pm 1\sigma$	$^{207}\text{Pb}^*/^{206}\text{Pb}^*$ date (Ma) $\pm 1\sigma$	Disc. (%)						
I	1	19.1	20	9	0.47	0.387	5.028	0.118	0.08085	0.00204	5.048	0.120	0.07759	0.00309	1165	26	1136	79	-2.5
I	3	21.1	723	171	0.24	0.040	5.193	0.269	0.07908	0.00037	5.195	0.269	0.07874	0.00039	1135	57	1166	10	2.6
I	11	11.1	1140	267	0.24	0.030	5.046	0.048	0.07898	0.00043	5.048	0.048	0.07875	0.00045	1165	10	1166	11	0.1
I	10	10.1	1095	384	0.36	-0.010	4.816	0.132	0.07887	0.00043	4.816	0.132	0.07895	0.00044	1216	31	1171	11	-3.9
I	4	4.1	1465	448	0.32	0.039	5.004	0.046	0.07946	0.00039	5.006	0.046	0.07915	0.00041	1174	10	1176	10	0.2
I	15	14.1	629	167	0.27	-0.097	5.021	0.053	0.07864	0.00060	5.016	0.053	0.07941	0.00069	1172	11	1182	17	0.9
I	2	20.1	1845	895	0.50	0.012	4.868	0.045	0.07952	0.00019	4.868	0.045	0.07942	0.00019	1204	10	1183	5	-1.8
I	19	18.1	1514	478	0.33	0.014	4.918	0.044	0.07955	0.00037	4.919	0.044	0.07944	0.00038	1193	10	1183	9	-0.8
I	17	16.1	815	164	0.21	-0.140	4.943	0.049	0.07844	0.00051	4.936	0.049	0.07955	0.00062	1189	11	1186	15	-0.3
I	12	12.1	806	196	0.25	-0.045	5.023	0.051	0.07927	0.00053	5.021	0.051	0.07963	0.00057	1171	11	1188	14	1.4
I	5	5.1	754	154	0.21	0.000	5.033	0.051	0.07969	0.00056	5.033	0.051	0.07969	0.00056	1168	11	1189	14	1.8
I	7	7.1	766	183	0.25	-0.048	5.075	0.052	0.07951	0.00240	5.072	0.052	0.07988	0.00241	1160	11	1194	59	2.9
I	8	8.1	899	293	0.34	0.029	5.095	0.051	0.08057	0.00053	5.096	0.051	0.08034	0.00055	1155	11	1205	14	4.2
I	18	17.1	677	141	0.22	-0.017	5.086	0.052	0.08044	0.00058	5.085	0.052	0.08058	0.00059	1157	11	1211	14	4.4
I	3	3.1	911	244	0.28	-0.225	5.069	0.050	0.07886	0.00050	5.058	0.050	0.08064	0.00066	1163	11	1213	16	4.1
X	16	15.1	244	62	0.26	0.000	3.547	0.046	0.09939	0.00089	3.547	0.046	0.09939	0.00089	1601	19	1613	17	0.7
D	6	6.1	36	19	0.56	0.772	4.421	0.157	0.07946	0.00277	4.455	0.160	0.07327	0.00522	1305	44	1022	144	-27.8
D	2	2.1	1039	229	0.23	-0.068	5.189	0.056	0.07994	0.00052	5.186	0.056	0.08048	0.00057	1137	11	1209	14	6.0
D	14	13.2	26	9	0.36	-1.021	5.047	0.898	0.08116	0.00321	4.996	0.890	0.08918	0.00645	1176	229	1408	138	16.5
D	13	13.1	42	12	0.29	-1.112	5.122	0.140	0.08104	0.00238	5.066	0.141	0.08976	0.00492	1161	30	1421	105	18.2
D	1	1.1	20	14	0.72	-1.320	5.096	0.209	0.08044	0.00372	5.030	0.212	0.09078	0.00810	1169	47	1442	170	18.9
D	9	9.1	24	10	0.43	-5.273	4.812	0.180	0.08213	0.00341	4.571	0.186	0.12181	0.01237	1275	49	1983	181	36

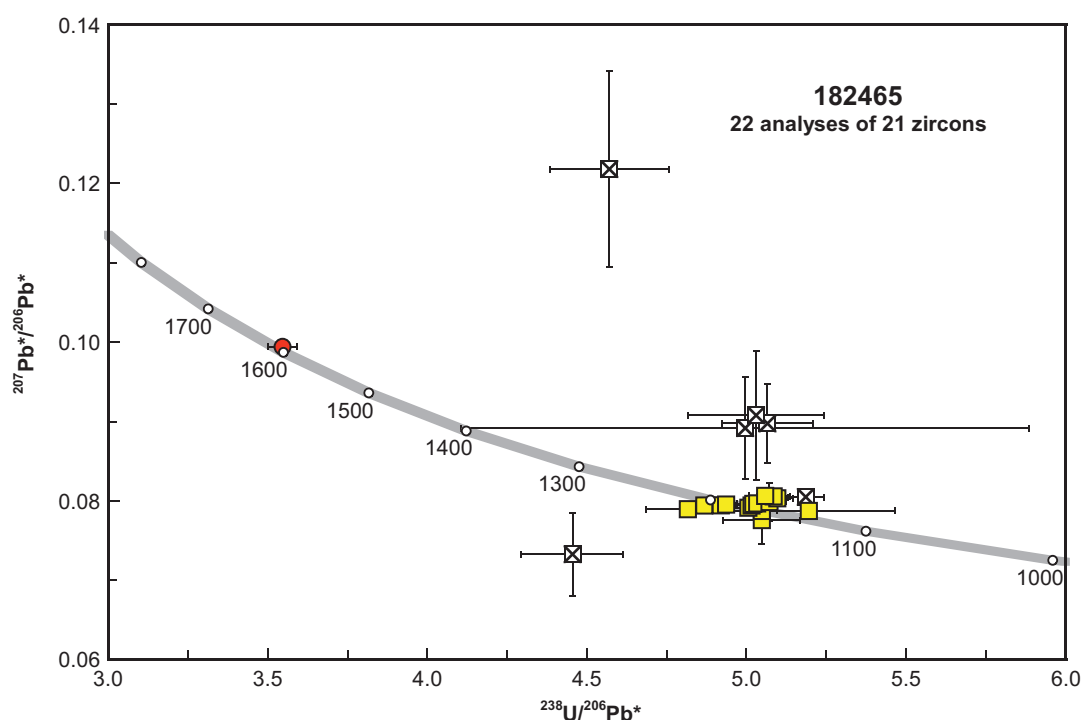


Figure 3. U–Pb analytical data for sample 182465: metagabbro, Splinter prospect. Yellow squares indicate Group I (magmatic zircons); red circle indicates Group X (xenocrystic zircon); crossed squares indicate Group D (discordance >5%).

Interpretation

The analyses are concordant to strongly discordant (Fig. 3). Six analyses are >5% discordant. The dates obtained from these six analyses (Group D; Table 1) are unreliable, and are considered not to be geologically significant. The remaining 16 analyses can be divided into two groups, based on their $^{207}\text{Pb}^*/^{206}\text{Pb}^*$ ratios.

Group I comprises 15 analyses of 15 zircons (Table 1), which yield a concordia age of 1178 ± 6 Ma (MSWD = 1.7).

Group X comprises one analysis (Table 1), which yields a $^{207}\text{Pb}^*/^{206}\text{Pb}^*$ date of 1613 ± 17 Ma (1σ).

The date of 1178 ± 6 Ma for the 15 analyses in Group I is interpreted as the magmatic crystallization age of the gabbro. The date of 1613 ± 17 Ma (1σ) for the single analysis in Group X is interpreted as the age of an inherited component.

References

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Recommended reference for this publication

Wingate, MTD, Lu, Y, Kirkland, CL and Spaggiari, CV 2016, 182465: metagabbro, Splinter prospect; *Geochronology Record 1304*: Geological Survey of Western Australia, 4p.

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