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Appendix 1.

Analytical Methods and Results

Baddeleyite, and in some cases zircon, were separated by crushing, grinding, and concentration by Wilfley table and heavy liquids. The baddeleyite consisted of tiny ($\Omega 200 \sigma m$) red-brown, translucent, striated and bladed crystals and crystal fragments. In general, the baddeleyite grain size in dike samples was considerably smaller ($<60 \sigma m$) than in gabbro sheets, resulting in low crystal yields and precluding multiple baddeleyite U-Pb analyses in some instances. The zircons, obtained from the southern Tobacco Root dikes consisted of small euhedral grains that were commonly cracked. They provided strongly discordant results and are not considered further. Isotopic compositions for U and Pb were obtained through thermal-ionization mass spectrometry using procedures described in French et al. (2002) for the analyses done at the University of Alberta laboratory and in Harlan et al. (2003) for those done at the U.S. Geological Survey laboratory in Denver. All age calculations were determined by using ISOPLOT/Ex (Ludwig, 2003). Except where otherwise indicated, uncertainties in isotopic ages are reported at the 95% confidence level.

TABLE DR1. U-Pb BADDELEYITE RESULTS FOR GUNBARREL IGNEOUS EVENTS

Sample No.	Mass (σg)	U (ppm)	Th* (ppm)	Pb (ppm)	Th/U	Pb [†] (pg)	²⁰⁶ Pb/ ²⁰⁴ Pb	²⁰⁶ Pb/ ²³⁸ U	²⁰⁷ Pb/ ²³⁵ U	²⁰⁷ Pb/ ²⁰⁶ Pb	²⁰⁷ Pb/ ²⁰⁶ Pb Model age (Ma)	Discordance (%)
<u>HY8A-91: Gunbarrel gabbro, Canada (65.6611°N, 118.1444°W)</u>												
6	10	479	31	57	0.06	13	2894	0.12591 ± 14	1.1306 ± 16	0.06512 ± 5	778.3 ± 1.6	1.9
7	11	461	28	54	0.06	6	6322	0.12563 ± 15	1.1293 ± 16	0.06519 ± 5	780.6 ± 1.7	2.4
<u>FA149-62: Calder gabbro sheet, Canada (65.55°N, 117.22°W)</u>												
8	42	237	14	28	0.06	14	5834	0.12696 ± 17	1.1407 ± 17	0.06516 ± 5	779.7 ± 1.5	1.3
9	60	134	8	16	0.06	25	2539	0.12563 ± 17	1.1282 ± 17	0.06513 ± 6	778.5 ± 2.0	2.1
10	35	312	27	38	0.09	15	5684	0.12719 ± 14	1.1429 ± 14	0.06517 ± 5	779.9 ± 1.5	1.1
<u>GFA92-567: Faber Lake gabbro sheet (64.12°N, 116.67°W)</u>												
1	42	1158	81	137	0.07	19	20,065	0.12615 ± 17	1.1332 ± 17	0.06515 ± 3	779.2 ± 1.0	1.8
2	42	1323	56	157	0.04	37	12,083	0.12717 ± 13	1.1428 ± 14	0.06517 ± 3	779.9 ± 1.0	1.1
<u>NW13-2: Concajou Canyon gabbro sill, Canada (64.17°N, 127.97°W)</u>												

3	18	514	27	62	0.05	25	2990	0.12618 ± 19	1.1341 ± 17	0.06519 ± 7	780.4 ± 2.2	2.0
4	15	62	39	72	0.06	16	4489	0.12631 ± 14	1.1346 ± 15	0.06515 ± 4	779.2 ± 1.4	1.7
<u>91T2-2: Muncho Lake diabase dike, Canada (58.78°N, 125.67°W)</u>												
5	4	786	56	93	0.07	5	5168	0.12598 ± 15	1.1306 ± 17	0.06509 ± 5	777.3 ± 1.5	1.7
<u>93T258-1: Christmas Lake diabase dike, Wyoming (44.98°N, 109.43°W)</u>												
11	4	947	90	114	0.10	7	4508	0.12673 ± 13	1.1385 ± 15	0.06516 ± 5	779.5 ± 1.5	1.4
12	2	557	54	66	0.10	3	2502	0.12384 ± 25	1.1069 ± 50	0.06483 ± 26	768.7 ± 8.4	2.2
<u>TR-7: Southern Tobacco Root Mountains dike, Montana (45.4156°N, 112.1327°W)</u>												
5 (43)	n.d. (60 gr)	—	—	—	—	—	2455	0.12689 ± 19	1.1413 ± 29	0.06524 ± 13	782 ± 4	1.9
6 (43)	n.d.	—	—	—	—	—	1402	0.11759 ± 12	1.0559 ± 70	0.06512 ± 40	778 ± 13	10.7
<u>TR-19: Southern Tobacco Root Mountains dike, Montana (45.4156°N, 112.1327°W)</u>												
5 (47)	n.d. (37 gr)	—	—	—	—	—	1990	0.12563 ± 48	1.1283 ± 43	0.06514 ± 23	779 ± 7	3.3
	n.d.	—	—	—	—	—	3011	0.11525 ± 111	1.0331 ± 10	0.06502 ± 18	775 ± 6	13.0

Note: Atomic ratios are corrected for fractionation (0.1%/amu), blank (2 pg Pb; 0.5 pg U), spike and common Pb (depleted mantle). All errors given in this table are 1 σ uncertainties and refer to the least-significant digit(s); n.d. indicates masses were not determined; 60 and 37 gr refer to the number of individual grains analyzed, where mass of the sample is not reported. For the samples from the U.S. Geological Survey laboratory where individual sample masses were not determined, absolute values for U, Th, and Pb concentrations are not reported.

*Th concentration estimated from abundance of ^{208}Pb and corresponding $^{207}\text{Pb}/^{206}\text{Pb}$ ages.

[†]Total amount of common Pb in picograms measured in the analysis.

[§] $^{206}\text{Pb}/^{204}\text{Pb}$ ratios are corrected for fractionation and spike only.

References:

- French, J.E., Heaman, L.M., and Chacko, T., 2002, Feasibility of chemical U-Th-total Pb baddeleyite dating by electron microprobe: *Chemical Geology*, v. 188, p. 85-104.
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