

U.S. DEPARTMENT OF THE INTERIOR

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GEOCHEMICAL DATA FOR JURASSIC DIABASE ASSOCIATED WITH EARLY
MESOZOIC BASINS IN THE EASTERN UNITED STATES:
DANVILLE BASIN AND VICINITY, VIRGINIA

By

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DANVILLE BASIN AND VICINITY, VIRGINIA

Seventeen (17) samples of diabase from one (1) sheet and twelve (12) dikes were collected by two (2) workers in Virginia and analyzed by the U.S. Geological Survey. Laura Cummins of Florida State University contributed seven (7) samples from seven (7) dikes for which partial chemistry is here provided. The balance of the chemistry (major- and selected trace-elements) available for these and many other dikes in this area is documented by Cummins (1987). Froelich and Gottfried collected five (5) samples from the Renan sheet of the Danville basin, the southernmost known quartz-normative diabase sheet in the province, and five (5) samples from five (5) different dikes for which complete chemistry is documented here. The Renan sheet and nine (9) of the ten (10) dikes samples are representative of the high Fe, quartz-normative (HFQ) magma, and one dike is olivine-normative.

The very low abundance of platinum (Pt) and palladium (Pd) in the sheet and most of the dikes is characteristic of the HFQ magma elsewhere in the province. The single olivine-normative dike sampled also has unusually low abundances of Pd and especially Pt for rocks of this magma type.

References

- Cummins, L.E., 1987, Geochemistry, mineralogy, and origin of Mesozoic diabase dikes of Virginia: unpublished Ph.D. thesis, Florida State University, Tallahassee, 454 p.

EXPLANATION FOR PLATE 1

Geochemical sample locality

- C- ● L.E. Cummins, 1987
● Froelich and Gottfried, USGS, 1985

DANVILLE BASIN AND VICINITY, VIRGINIA

SAMPLE NO.	MAGMA TYPE	DESCRIPTION OF SAMPLES
		Renan sheet - Table 1
FG 85 DV-2	High Fe, quartz-normative	Diabase
-3	"	"
-5	"	"
-6	"	" chilled margin
-13	"	Diabase
		Diabase dikes - Table 2
FG 85 DV-7	High Fe, quartz-normative	Diabase
-8	"	"
-9	"	"
-10	"	"
-11	Olivine-normative	"
		Diabase dikes
		L. Cummins samples - Table 3
C-15A-2	High Fe, quartz-normative	Diabase
C-15B-2	"	"
C-15D-2	"	"
C-16A-1	"	"
C-47A-1	"	"
C-48C-2	"	"
C-78A-1	"	"

Table 1. Danville basin, Virginia. Renan sheet.

	W-243400	W-243401	W-243402	W-243403	W-243408
	FG-85	FG-85	FG-85	FG-85	FG-85
	DV2	DV3	DV5	DV6	DV13
Lat.	36°59'N	36°39'N	37° 0'N	37° 0'N	37° 1'N
Long.	79° 9'W	79° 9'W	79° 9'W	79° 9'W	79° 7'W
SiO ₂ (%)	53.08	52.53	52.16	52.90	52.46
TiO ₂	1.00	0.94	1.06	1.01	0.93
Al ₂ O ₃	13.90	13.67	13.57	13.80	14.00
Fe ₂ O ₃	13.20	12.83	13.56	13.19	12.87
MnO	0.21	0.23	0.22	0.21	0.23
MgO	6.29	6.66	6.31	6.26	6.73
CaO	9.83	9.80	9.94	9.74	9.70
Na ₂ O	2.42	2.20	2.39	2.31	2.27
K ₂ O	0.56	0.54	0.55	0.56	0.67
P ₂ O ₅	0.14	0.13	0.13	0.13	0.12
S	0.06	<0.01	0.06	0.08	0.08
F	0.02	0.02	0.01	0.02	0.02
Cl	0.01	0.04	<0.00	<0.00	0.12
Σ	100.72	99.58	99.97	100.20	100.19
B (ppm)	10.0	31	<1.00	17.1	—
Sc	46	46	45	48	43
Cr	85	102	83	81	98
Co	48	48	47	51	50
Ni	49	56	48	51	59
Cu	64	61	54	58	71
Zn	79	93	71	77	125
As	1.90	1.60	<1.50	<1.50	<1.70
Rb	23.0	33	19.0	13.0	30
Sr	153	139	157	146	140
Sb	0.34	<0.180	0.220	<0.210	<0.210
Cs	0.79	1.70	0.86	0.85	1.40
Ba	139	193	142	136	146
Y	30	25.0	29.0	30	31
La	9.5	8.7	9.6	9.8	8.9
Ce	19.9	19.0	20.0	21.0	18.0
Nd	10.0	9.8	12.0	11.0	10.0
Sm	2.99	2.84	2.99	3.0	2.80
Eu	10.00	0.93	0.98	1.00	0.90
Tb	0.69	0.64	0.70	0.76	0.74
Yb	2.92	2.70	2.90	3.1	2.80
Lu	0.44	0.38	0.41	0.47	0.44
Zr	87	88	86	96	86
Hf	2.22	2.10	2.20	2.30	2.00
Nb	4.8	4.4	5.4	4.9	4.6
Ta	0.38	0.35	0.45	0.45	0.34
Th	2.20	1.90	2.20	2.30	1.90
U	0.38	0.61	0.60	<0.60	0.280
Pd (ppb)	1.40	1.00	1.50	1.50	1.50
Pt	2.00	2.00	2.20	1.40	3.6
Au	<12.0	<10.0	<5.0	<12.0	<10.0

Table 2. Diabase dikes.

	W-243404	W-243405	W-243417	W-243406	W-243407
	FG-85	FG-85	FG-85	FG-85	FG-85
	DV7	DV8	DV9	DV10	DV11
Lat.	36°58'N	36°37'N	36°57'N	36°57'N	36°57'N
Long.	79° 9'W	79° 9'W	79° 9'W	79° 9'W	79°10'W
SiO ₂ (%)	52.95	53.25	52.88	52.61	47.23
TiO ₂	1.03	1.04	1.09	1.00	0.47
Al ₂ O ₃	14.37	14.02	13.88	14.02	16.56
Fe ₂ O ₃ *	13.45	13.35	13.44	13.27	12.70
MnO	0.21	0.21	0.21	0.21	0.19
MgO	5.58	5.97	5.82	6.21	9.68
CaO	9.63	9.68	9.64	10.11	11.13
Na ₂ O	2.57	2.40	2.46	2.42	2.04
K ₂ O	0.69	0.64	0.62	0.30	0.22
P ₂ O ₅	0.14	0.14	0.15	0.14	0.08
S	0.06	0.08	0.07	0.07	0.07
F	0.02	0.02	0.01	0.02	0.01
Cl	<0.00	<0.00	0.00	<0.00	<0.00
Σ	100.71	100.80	100.28	100.38	100.38
B (ppm)	—	24.1	10.1	—	32
Sc	44	46	46	44	42
Cr	74	79	72	81	310
Co	47	48	47	46	58
Ni	45	48	45	51	260
Cu	63	64	62	67	126
Zn	85	84	87	82	77
As	1.70	<1.60	<2.70	<1.60	<1.50
Rb	19.0	15.0	14.0	7.0	3.0
Sr	153	151	143	191	77
Sb	<0.210	<0.210	0.54	<0.220	<0.200
Cs	1.10	1.10	0.67	<0.280	1.70
Ba	157	148	144	152	109
Y	37	28.0	30	24.0	20.0
La	11.0	9.8	10.0	9.2	4.0
Ce	21.4	21.0	21.0	19.0	8.5
Nd	12.0	11.0	13.0	11.0	<7.0
Sm	3.3	3.0	3.2	2.97	1.29
Eu	1.07	1.02	1.00	0.92	0.47
Tb	0.78	0.71	0.76	0.73	0.46
Yb	3.3	3.0	3.2	2.90	2.70
Lu	0.48	0.45	0.49	0.44	0.44
Zr	89	89	94	92	43
Hf	2.40	2.43	2.40	2.00	0.84
Nb	5.2	5.7	5.3	5.3	1.50
Ta	0.41	0.39	0.42	0.39	<0.160
Th	2.20	2.30	2.40	1.90	0.33
U	<1.60	0.55	0.67	0.74	<0.60
Pd (ppb)	0.70	1.10	2.00	1.80	4.7
Pt	1.80	2.40	3.2	1.50	3.1
Au	<6.0	<9.0	<12.0	<10.0	<9.0

Table 3. Diabase dikes.

	W-250879	W-250880	W-250881	W-250882	W-250883	W-250884	W-250885
	C-15A-2	C-15B-2	C-15D-2	C-16A-1	C-47A-1	C-48C-2	C-78A-1
Lat.	36°42'N	36°38'N	36°35'N	36°40'N	36°23'N	36°52'N	37°11'N
Long.	79°18'W	79°26'W	79°18'W	79°33'W	79°21'W	79°38'W	79°32'W
Fe ₂ O ₃ (%)	13.47	13.37	13.01	13.96	13.40	14.20	14.09
CaO	8.0	8.0	8.3	9.5	8.8	8.0	9.1
Na ₂ O	3.09	2.97	3.13	2.80	3.22	3.15	2.75
Sc (ppm)	42	39	40	44	41	43	44
Cr	20.0	5.8	19.0	15.0	20.0	11.0	14.0
Co	51	42	45	46	43	48	47
Ni	15.0	7.3	15.0	16.0	15.0	12.0	13.0
Cu	25.0	18.0	25.0	38	23.0	25.0	31
Zn	110	120	110	120	110	140	128
As	<2.30	<0.80	2.10	1.80	1.60	<0.90	1.90
Rb	41	42	45	29.0	23.0	38	30
Sr	300	280	320	290	310	290	310
Sb	0.170	0.120	0.260	0.140	0.230	0.200	0.220
Cs	0.61	0.78	0.52	1.10	0.96	0.78	0.74
Ba	240	310	430	260	210	280	260
La	15.0	18.6	15.0	15.0	15.0	15.8	14.5
Ce	32	40	31	31	32	33	31
Nd	16.0	19.0	16.0	16.0	15.0	19.0	16.0
Sm	4.5	5.6	4.4	4.4	4.5	4.7	4.4
Eu	1.40	1.60	1.40	1.30	1.40	1.42	1.34
Tb	0.92	1.02	0.81	0.84	0.87	0.85	0.84
Yb	3.5	3.9	3.2	3.4	3.3	3.4	3.4
Lu	0.51	0.57	0.45	0.46	0.45	0.49	0.48
Hf	3.0	3.8	3.1	3.2	3.1	3.2	2.98
Ta	0.85	0.68	0.56	0.55	0.79	0.61	0.57
Th	3.0	3.5	2.90	2.80	3.2	3.1	2.79
U	0.74	0.93	0.92	0.73	0.86	0.82	0.70
Au (ppb)	<2.80	<6.0	<2.50	<2.50	<2.30	<4.0	<2.90