

الزجاج البركاني في اليمن*

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2000

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.2.1

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.3.1

.(1976 1983)

.4.1

. (%1-0.3) 1
 .(% 10) - 2
 .(% 5 - 2) - 3
 . () - 4

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.1 .2

(% 5 - 2

870

1941

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(1)

(1)

38	32		

3			
200	15		
23	80		
1.1	100		

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% 83 1982 *

.(Arizona) .

(Sonora) :

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() (URAS)

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. (Kenlieth)

.2.1.2

(Onion Like)

1100 C⁰ - 760 C⁰ (5.7- 5)

. ³ / 6.20 - 2.36 . 20-15

.3 .1.2

SiO₂ ()
(2)

(%) (2)

		()	()			
		()	()			
73.6	74.1	73-74	72.8	73.5	-75 72	SiO ₂
12.7	13.3	12-15	13.8	13	-15 13	Al ₂ O ₃
0.7	1.8	-1.2 0.7	2.1	1.8	1.5	Fe ₂ O ₃
0.6	1.5	0.7	0.9	1.5	1	CaO
0.2	0.4	0.3	0.4	0.4	0.6	MgO
5	3.8	-4.8 3.0	-	3.8	4.8	K ₂ O
3.2	3.5	-4.1 3.4	3.3	3.5	2.7	Na ₂ O
0.1	0.05	0.06	0.3	-	-	TiO ₂
3.8	3	2.5	-	3	3-6	H ₂ O

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.2.2

.1 .2.2

. (6- 5)

.2.2.2

(3)

(3)

70.5	74.2	72.50	67.80	73.08	71.75	SiO ₂
13.5	12.52	21.59	14.00	13.84	12.33	AL ₂ O ₃
1.1	1.62	0.90	-3.00	1.16	1.98	Fe ₂ O ₃
3.4	-	-	-	-	-	H ₂ O
1.6	-	3.62	3.40	2.76	3.59	Na ₂ O
1.8	-	4.71	3.10	2.61	4.47	K ₂ O
0.8	0.44	0.80	1.50	1.34	-	CaO
0.5	0.17	-	-	0.28	0.12	MgO

.3.2.2

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' ' ' ' ' ' ' ' (

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(2.5 – 2.3)

(2.5- 5)

()

(bubbles)

2.3.2

SiO2

()

(4)

(4)

(1)	(2)	(3)	
73.66	74.57	72.31	SiO ₂
0.22	0.17	0.42	TiO ₂
13.45	12.58	10.88	Al ₂ O ₃
1.25	1.30	2.98	Fe ₂ O ₃
0.75	1.02	2.42	FeO
0.03	0.05	0.14	MnO
0.32	0.11	0.16	MgO
1.13	0.61	0.68	CaO
2.99	4.13	5.17	Na ₂ O
5.35	4.73	4.42	K ₂ O
0.07	0.07	0.03	P ₂ O ₅
0.78	0.66	0.45	H ₂ O+
100	100	100.6	Total

- (1) Average calc alkalic rhyolite – obsidian**
- (2) Average alkalic rhyolite – obsidian**
- (3) Average per alkalic rhyolite –rhyolite –obsidian.**

.1.3

%70

- :**
- 1**
- 2**
- 3**
- 4**
- 5**
- 6**
- 7**
- 8**

-9
10
-11

.2 .3

-:

(Pozzolan)

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.3.3

(5)

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-	()	
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.1.4

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(1)

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: (2)

.1.2. 4

(1)

13 8,428,250E - 1,611,000N :

(2)

18 8,419,500E-1,601,000N :

(3)

21

(4)

42

90

³ 0.14

(5)

74

8,383,750E-1,601,00N :

()

³ 0.11

(6)

79

8,381,250E-1,599,500N :

. 3 4.4 .

(7)

84

8,382,500E-1,595,250N :

. 3

0.09

. ()

(8)

19

8,418,750E-1,634,250N :

.³

85,8

()

(9)

34

(10)

() () (10)
16

15 8,423,500E-1,602,500N : (11)

(12)

8

(13)

8,400,000E-1,636,500N :

1 2 10 - 1 '

(compact-perlitic)

.(augite)

.³ 20

(14)

. 8,438,500E-1,565,000N

14

50-15 ' ()

. 5 800

4

(40) (tuff) 50-2 ()

()

.³ 0.07

- .2.2.4

(15)

30

' 60

. 200

.³ 500,000

- - (16)

8,450,500E-1,606,000N :

² 4 - ² 2

15

10-2

.³ 30

- (17)

8,444,500E - 1,601,000N :

18

. 4 - 6

- 2,5

(0.4)

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.³ 4.5

. 3 .2. 4
(18)

() 37
. 3 300

4.2.4
(19)

' 300
' ()

. 6-2

() (20)

()

(6 - 5)

()

.()

.3 .4

.(7·8·9)

.(4 2·3)

%2

(K₂O + Na₂O)

(6)

3				
20		()		1
0.07		()		2
0.16		()		3
0.14		()		4
0.11		()		5
4.4) (6
0.09				7
85.8) (8
300		()		9
0.5				10
30) (11
4.5		+		12

(7)

	VG 006	VG 010	VG 017	VG 021	VG 028	30VG 0
SiO₂	73.44	74.98	77.13	76.35	71.57	66.5
TiO₂	0.30	0.34	0.23	0.27	1.04	1.0
Al₂O₃	10.19	10.22	10.99	10.69	11.53	14.3
Fe₂O₃	2.27	1.32	1.44	2.19	2.09	4.3
Mn O	0.15	0.15	0.08	0.07	0.11	-
Mg O	0.25	0.23	0.20	0.19	0.30	1.1
Ca O	0.33	0.43	0.26	0.36	0.46	0.8
Na₂O	4.33	3.36	4.94	4.97	4.64	-
K₂O	4.43	4.26	3.80	4.22	3.56	1.1
P₂O₅	0.22	0.25	0.27	0.27	0.20	-
I.O.i	4.07	4.22	0.58	0.37	4.45	5.03
TOTAL	99.98	99.96	99.95	99.95	99.95	93.63

(1998)

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(8)

(1983,)

SIO₂	73.32	96.88	74.60	70,84	70.60	70.92	69.25
AL₂O₃	10.10	15.56	12.40	3.50	15.00	12.00	14.42
Fe₂O₃	1.53	0.79	1.10	12.12	1.00	3.20	0.71
CaO	0.84	0.45	0.35	0.58	0.38	1.15	1.06
MgO	0.10	0.14	0.26	0.22	0.36	0.43	0.32
K₂O	4.75	2.70	3.75	3.25	4.00	3.50	3.60
Na₂O	3.90	5.05	5.25	3.70	2.87	3.50	4.20
TiO₂	0.28	0.24	0.17	0.18	0.24	1.60	0.15
H₂O	3.30	3.03	0.88	3.00	4.10	1.60	4.28

(9)

(1983,)

Na ₂ O	K ₂ O	CaO	MGO	Fe ₂ O ₃	AL ₂ O ₃	SiO ₂			
4.6	-	0.78	0.73	1.22	12.26	68.28			1
3.85	3.6	2.38	1.20	3.36	12.27	65.95			2
4.9	3.5	0.98	0.74	1.90	12.22	71.65			3
4.87	3.75	1.53	0.80	1.11	12.70	70.43			4
4.40	3.50	1.39	1.40	1.9	12.22	68.26			5
4.50	3.75	1.25	0.50	1.36	13.30	68.48			6
4.17	3.50	1.53	0.70	1.36	13.84	68.33			7
5.12	3.50	0.70	0.70	0.40	13.38	71.53			8
4.20	4	1.11	0.90	0.64	9.21	68.65			9
4.55	3.50	2.38	1	2.73	14	71.02			10
4.32	4.25	1.96	0.90	5.25	13.47	66.15			12
5	3.75	2.10	0.10	2.76	19.59	68.87			14
3.40	3.51	-	3.25	3.64	12.50	63.76	()		15

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5/8 in- 3/ 8 in- 200 mesh. -:

760

1200

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2000

6600

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80%

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(11)

. 1995-1990

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1995	1994	1993	1992	1991	1990	
700	644	569	514	514	576	
165	165	148	281	134	139	
200	200	250	250	286	240	
200	200	200	203	203	203	
104	85	80	93	88	93	
50	50	50	50	50	54	
35	35	35	43	49	42	
20	20	20	3	3	3	
6	6	6	5	6	2	
6	5	10	50	80	150	
5	5	5	5	5	5	
1,551	1,480	1,437	1,588	1,488	1,578	

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: (Expanded Perlite)

33

399

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366

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353

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312

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303

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(12)

.3 .6

2000

6600

1980 (USBM)

700

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(USGS)

(13

(/)

(12)

8.31	1962
8.39	1963
8.78	1964
8.55	1965
9.67	1966
9.62	1967
9.87	1968
10.82	1969
10.75	1970
11.44	1971
11.44	1972
10.28	1973
12.66	1974
14.22	1975

18.99	1976
18.01	1977

Source :Meisinger ,1980 F.O.B.Processing Plant

1979 2.32 1974 1979 - 1974 .4.6
%17 3.7 . %43
27.9 1997 24.2 1996 3.46

(13)

700	500	200		
10	5	5		
710	505	205		
200	100	100		
10	5	5		
10	5	5		
1500	1000	500		
70	55	15		
1790	1165	625		
35	25	10		
25	15	10		
4000	3000	1000		
40	30	10		
4100	3070	1030		
6600	4740	1860		

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.5.6

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(USGS)

. 1997

11,2

(

17

(14)

(14)

	1976	1977	1978	1979	1980
	63	72	24	27	28
	1	1	2	2	2
	120	120	120	120	120
		-	-	-	-
		1928	2294	1579	1440
		626	827	692	695
	2422	-	21	20	20
	441	825	860	940	880
	-	31	44	44	45
	949	1527	759	854	860
	55	1178	1208	1172	543
	906				

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(15)

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.6.6

%59

850,000 1986 830,000 1997
 1996 292,000 %16
 (%5.9) (%4.9) (%7.1) 1997 339,000
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 .7.6
 (52%)
 29 %6.9 %16.5
 %5.7 1997 .
 1997 14.8 612,000 1996
 (Oregon) . 16.1 577,000
 (Idaho) ' (California) '(New Mexico)
 .(Kansas) ' (Arizona)

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/ , / , / - / (1997)		-2
/ (1989)	:	-3

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- 4 - *Peter W. Harben , 1995 .The industrial Minerals Hand Book , .*
- 5- *Geological Report on The inventory of The Construction and industrial rocks in Yemen . Bucharest , Romania - 1985*

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