NEW MAJOR-ELEMENT ABUNDANCES AND INTERELEMENT CORRELATIONS FOR GEORGIA TEKTITES;

Edward F. Albin and Michael F. Roden, Department of Geology, The University of Georgia, Athens, Georgia 30602-2501.

Tektites found in Georgia (georgiaites) are a variety of macro-tektite from the North American tektite strewn field [e.g., 1,2]. Although approximately one thousand specimens have been collected [3], previous studies [4-8] draw conclusions based on the analysis of only 16 georgiaites. We analyzed eighteen additional specimens by electron microprobe to further document bulk compositions of the tektites and to search for correlations between elements or element ratios.

Tektites used in this investigation are part of a very large georgiaite collection (95 specimens) belonging to the Fernbank Science Center in Atlanta, Georgia [9]. Major-element compositions were determined with an automated four spectrometer JEOL 8600 electron microprobe using Bence-Albee matrix correction procedures. Small chips 2-6mm in diameter were separated from each tektite, mounted in epoxy, and polished. Reported abundances are averages of multiple point analyses using a 5 micron diameter beam to avoid Na loss by volatilization.

Major-element compositions are summarized in Table 1. The tektites are all glassy and are anhydrous or nearly so based on relatively high analytical totals. Georgia tektites in this research show a range in composition as follows: SiO_2 (79.6 - 83.4%), Al_2O_3 (10.2 - 12.5%), TiO_2 (0.5 - 0.6%), FeO (1.9 - 3.4%), MgO (0.5 - 0.8%), CaO (0.4 - 0.5%), K_2O (2.3 - 2.7%), and Na_2O (1.0 - 1.2%). Silica shows the least variability ($\pm$ approximately 3 relative percent about a mean of 81.6) compared to other oxides which vary approximately 10 relative percent (Al_2O_3, TiO_2, CaO, and Na_2O) to more than 20 relative percent (FeO, MgO, and K_2O). As noted previously [6], there is a pronounced inverse correlation between SiO_2 and Al_2O_3, TiO_2, and FeO (Figure 1). Important volatile and refractory element ratios such as Na_2O/K_2O (0.4 - 0.5), CaO/TiO_2 (0.8 - 1.0), Al_2O_3/MgO (15.2 - 21.6), FeO/MgO (3.6 - 4.6), K_2O/MgO (2.9 - 5.1), and Na_2O/MgO (1.4 - 2.3) also show significant variation (Figure 2).

These new results broaden the compositional range for most of the major-elements which occur in Georgia tektites. Georgiaites are the high-silica end members of the North American tektite strewn field [10]. The inverse relationship between SiO_2 and (Al_2O_3, TiO_2, FeO) has been attributed to fractional vaporization of silica or the incorporation of different amounts of Si-rich material [11]. Variations observed in FeO, MgO, and K_2O may reflect an inhomogeneous target material. A more precisely defined soda-potash diagram can be used to better distinguish georgiaites from other subgroups (e.g., bediasites) in the North American tektite strewn field. Ratios calculated for volatile and refractory elements can be used to not only differentiate various sub-strewn fields but to assist in an interpretation of probable precursor material composition and mixing trends [12].

Figure 1. Diagrams showing the inverse correlation between silica and other major-elements in georgiaites.

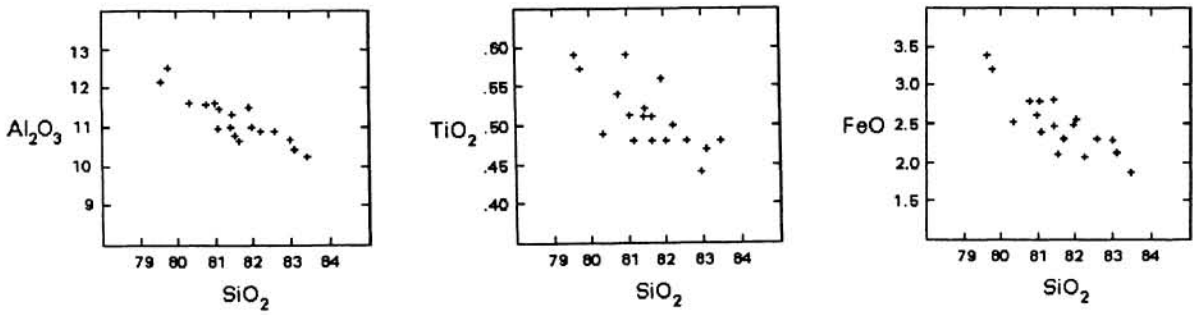

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Table 1. Major-element composition of 18 Georgia tektites obtained by electron microprobe analysis (in wt. %).

FSC #	SiO_2	Al_2O_3	TiO_2	FeO	MgO	CaO	K_2O	Na_2O	Total
GT-07	81.92	11.44	0.56	2.49	0.64	0.44	2.37	1.02	100.88
GT-08	83.44	10.23	0.48	1.89	0.50	0.40	2.48	1.13	100.55
GT-10	79.58	12.12	0.59	3.39	0.80	0.51	2.45	1.22	100.66
GT-23	82.61	10.86	0.48	2.30	0.57	0.43	2.56	1.14	100.95
GT-24	82.03	10.99	0.48	2.54	0.55	0.41	2.67	1.22	100.92
GT-27	79.76	12.50	0.57	3.20	0.77	0.51	2.27	1.05	100.63
GT-30	80.97	11.58	0.59	2.58	0.64	0.46	2.47	1.17	100.46
GT-32	81.46	11.29	0.52	2.45	0.54	0.44	2.51	1.12	100.33
GT-33	82.22	10.88	0.50	2.07	0.57	0.42	2.58	1.05	100.29
GT-34	82.98	10.69	0.44	2.27	0.55	0.44	2.56	1.21	101.14
GT-37	80.33	11.61	0.49	2.51	0.62	0.49	2.49	1.01	99.55
GT-48	83.12	10.42	0.47	2.12	0.52	0.44	2.64	1.06	100.79
GT-55	81.41	10.98	0.51	2.77	0.59	0.46	2.50	1.18	100.40
GT-60	81.06	10.97	0.48	2.41	0.63	0.43	2.48	1.18	99.64
GT-78	80.77	11.53	0.54	2.76	0.62	0.50	2.40	1.09	100.21
GT-83	81.03	11.44	0.51	2.77	0.66	0.48	2.38	1.08	100.35
GT-93	81.54	10.78	0.51	2.12	0.50	0.41	2.49	1.14	99.49
GT-94	81.64	10.64	0.48	2.27	0.58	0.40	2.51	1.23	99.75
AVG	81.55	11.16	0.51	2.50	0.60	0.45	2.49	1.13	100.39

Figure 2. Volatile and refractory oxide ratio diagrams for georgiaites in this study.