PETROGRAPHY OF SOME BELIZE TEKTITES.

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Introduction: During the 1990s, Hildebrand et al. [1] studied three tektites found among archaeological objects at Tikal, Guatemala, and concluded that they were tektites produced in an impact within upper crustal rocks of intermediate composition in the Central American region. Subsequently, Izett and Meeker [2] studied two western Belize tektites, one found by J. H. Cornec near San Ignacio and one found by A. Ford in an archaeological site a few km away. Both tektites had total radioisotopic ages akin to the single age reported in [1], i.e., about 800$\pm$40ka (2σ). Later, Schwarz et al. [3] obtained one plateau age of 769$\pm$16ka (2σ). These tektite ages are indistinguishable from Australasian tektites [3], but compositionally the Belize tektites are different in some important ways [4,5]. Previously, we reported on chemical analyses of some Belize tektites and their likely stratigraphic occurrence [6].

Since 1990, J. H. Cornec, D. Milham, and others have collected hundreds of tektites, mostly in the 1-3 cm size range, from an area between San Ignacio and Spanish Lookout in western Belize. This area has been referred to as a potential strewn field [4], the limits of which may extend farther than is presently known.

Petrographic analysis of doubly polished thin sections of three Belize tektites in this study shows rare grains of lechatelierite and quartz, plus rare opaque grains. Rare is used here to mean significantly less than 0.1 volume percent of the tektite glass. Numerous very small bubbles closely attend some impact-affected quartz grains. In addition, the tektite glass showed a relatively low content of larger, independent vesicles and pervasive vague schlieren.

Lechatelierite and quartz inclusions: The two most common of the rare inclusions in the tektite glass studied are: (A) lechatelierite (high-temperature amorphous SiO_2 derived from quartz and in some instances including quartz regions within) and (B) quartz (including embayed grains, quartz grains showing incipient melting that was quenched, and quartz with toasted patches and ballen texture). Lechatelierite grains are on average about 50 microns in long dimension and subangular. Most lechatelierite in our thin sections is embayed (on the margins and/or within the grain) and contains at least some brown regions that appear to have been originally toasted. Ballen is present in some lechatelierite grains and some grains contain regions of apparently unaltered quartz. Quartz grains are on average about 40 microns in long dimension. They range from pristine and apparently unaltered quartz to embayed grains showing incipient melting and toasting. The size of these grains suggests they were very fine (wind-blown?) silt particles from within the upper target materials.

Other inclusions: Rare opaque grains comprise most of the other inclusions in the Belize tektites examined. Opaque grains tend to occur near lechatelierite and quartz inclusions and tend they to be significantly (~50%) smaller than typical lechatelierite or quartz grains. Opaque grains are usually black, but some have a slight red hue on the periphery. Opaque grains were not observed in incipient melting situations and are not embayed. Opaque grains may have been particles within a likely residual, lateritic soil in the target area. Magnetic measurements indicate that among Belize tektites in general a few specimens contain a significant amount of magnetite inclusions, with concentrations up to 200 ppm.

Vesicles and bubbles: Vesicles are rare components of the three specimens studied. The average size is 0.6 mm, but the range was 0.1 to 0.8 mm. Vesicles are round in all instances that we observed and were approximately evenly distributed throughout the tektite glass in each specimen. Vesicle size is comparable to the apparent diameter of surface pits on the Belize tektites we studied. Bubbles are distinguished from vesicles in this report. Bubbles are on average about 0.1 mm or less in diameter and tend to occur in clusters of a few to more than 20, and the clusters are in direct physical contact with lechatelierite and ballen quartz grains. Bubbles are interpreted as being related to gas expulsion due to alteration effects in the related inclusions.

Schlieren: Belize tektite glass that we observed is very pale yellowish brown and quite uniform in overall appearance. Schlieren in our three tektites was pervasive but very subtle. Adjacent individual flow bands or streaks typically were not profoundly different in color, grain or vesicle content, vesicle shape, or translucence. Grains within the schlieren were not deformed and the flow-banding itself was not significantly folded, deformed, or contorted in any instance that we observed.

References: [1] Hildebrand A. G. et al. (1994) Abstract on p.549, 25th Lunar & Planetary Science Conference. [2] Izett G. A. and Meeker G. P. (1995) Abstract on p. A-207, Geological Society of America meeting. [3] Schwarz W. H. et al. (2016) *Geochemica et Cosmochemica Acta* 178: 309-317. [4] Koeberl C. and Glass B. P. (2014) Abstract #5034, 77th Meteoritical Society meeting. [5] Koeberl C. et al. (2015) Abstract #5320, 78th Meteoritical Society meeting. [6] King Jr. D. T. et al. (2016), Abstract #2910, 47th Lunar & Planetary Science Conference.

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