MUONG NONG-TYPE AUSTRALASIAN TEKTITES: IMPLICATIONS REGARDING THE PARENT MATERIAL AND SOURCE AREA.

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Introduction: In 1963, I took a course in geochemistry from Brian Mason in which he had all the students write a term paper on tektites. Shortly thereafter I was studying deep-sea cores taken south of Australia and I kept finding small glass beads that I was calling "cosmic spherules (?)". Another graduate student, Dave Folger, who had also taken Brian's course, suggested that they might be tektites. It made sense. I realized that the glass beads only occurred on or adjacent to the Brunhes/Matuyama geomagnetic reversal boundary, indicating that their stratigraphic age was they same as the radiometric age of the australite tektites. I eventually published a paper announcing the discovery of microtektites [1]. This led to an interest in tektites, and then to impact cratering, shock metamorphism, and distal impact ejecta, subjects that I have spent most of my professional life studying. After graduation, I had to spend two years active duty in the U. S. Army and through the help of John A. O'Keefe was assigned to Goddard Space Flight Center. It was there that I heard of a faculty position at the University of Delaware for which I applied and where I have been ever since. So you could say that Brian Mason is responsible for my entire Professional career. Ironically, Brian remains somewhat skeptical about the genetic relationship between microtektites and tektites [2]. Thus, this abstract deals with Muong Nong-type Australasian tektites rather than microtektites.

When I first started studying tektites, the origin was not agreed upon. Today, most researchers agree that tektites are the products of terrestrial impacts [3,4]. Source craters have been found for three out of the four known tektite strewn fields; however, the source crater for the Australasian strewn field remains elusive. Muong Nong-type tektites may hold the answer to this problem.

Muong Nong-type Tektites: Muong Nong-type (MN) tektites are large, blocky, layered tektites found almost exclusively in the Indochina part of the Australasian strewn field. MN tektites are compositionally and petrographically similar to the splash form and ablated tektites, but there are some important differences. They are compositionally more heterogeneous on a millimeter scale and they have higher water and ^{10}Be contents [4], and unlike the splash form and ablated tektites, many MN tektites contain mineral inclusions.

Mineral Inclusions: Barnes [5] first reported detrital mineral gains (probably quartz) in MN tektites and Walter [6] was the first to report coesite. For several years we have been recovering mineral inclusions from MN tektites by crushing, sieving, and heavy liquid separation [7]. In addition to quartz and coesite, we have recovered zircon, rutile, chromite, monazite, and a corundum-bearing phase. Quartz, zircon, rutile, chromite, and monazite appear to be relict grains –i.e., mineral grains that were present in the parent material that was melted to produce the tektite glass. On the other hand, coesite and the corundum-bearing phase are shock-produced phases. Coesite is a high-pressure phase produced from quartz. The corundum-bearing grains have an Al_2SiO_5 composition and appear to have formed by the breakdown of an Al_2SiO_5 mineral to corundum plus SiO_2 glass. Inclusion concentration (number per unit sample weight) varies from zero to over 2000 per 10 gm of tektite sample. The mineral inclusions generally range between ~20 and 200 μm and are size sorted according to density. The mineral inclusions show evidence of shock metamorphism including fragmentation, x-ray asterism, partial melting (especially rutile), and thermal decomposition (some of the zircons have partially decomposed to baddeleyite).

Discussion and Conclusion: The size, shape, sorting, and mineral assemblage of the inclusions recovered from MN tektites indicates that the parent material was a fine-grained, well-sorted sedimentary deposit [7]. A more recent study of the geographic variations in the concentration of mineral inclusions indicates that the highest concentration occurs in MN tektites from central Laos and adjacent eastern Thailand [8]. MN tektites from this region are also more likely to contain relict phases with lower melting temperatures, such as quartz and rutile, in addition to the phases with higher melting temperatures. Assuming that the degree of shock metamorphism increases away from the source crater, geographic variations in the concentration and kinds of mineral inclusions suggest that the source crater should be in the central Laos-eastern Thailand region. This study is continuing.

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