BERYLLIUM-10 IN MUONG NONG-TYPE TEKTITES.

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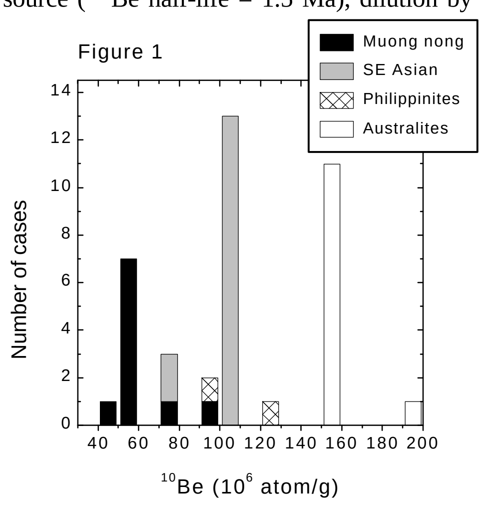
Introduction: The ^{10}Be contents of Australasian tektites show systematic regional variations. Splash-form tektites from Australia and southeast Asia contain on average 150×10^6 atom/g and 100×10^6 atom ^{10}Be/g, respectively [1]. This ^{10}Be formed in the atmosphere, fell with rain and dust, and was incorporated into sediments.

The Muong Nong-type or layered tektites are found in a band 1100 km long that runs from Hainan, China to Cambodia. Two very different models have been proposed for their origin: 1) they, like all other Australasian tektites, were ejected from one large crater somewhere in southeast Asia and traveled the shortest distances, ≤~500 km [4]; or 2) they, unlike all other Australasian tektites, were parts of melt-sheets, now largely destroyed, that formed when the accretional energy was spread out over a large area [5].

Scattered reports indicate that the Muong Nong-type tektites contain less ^{10}Be than other types. Few of the actual measurements or sample descriptions have been published, however. We present ^{10}Be measurements of five layered tektites and discuss some implications for tektite formation.

Results: The samples were collected in NE Thailand, Laos, Hainan Island, and Vietnam [5,7]. A distance of 640 km lies between the recovery sites of Non-Hung (Thailand) and Lingshui (Hainan Island). We separated Be from 500-mg samples and analyzed for ^{10}Be by accelerator mass spectrometry at Purdue University's PRIME Lab. Results follow (sample name, 10^6 atom ^{10}Be/g): (Huai-Sai, 41 ± 2); (Lingshui, 58 ± 3); (Muong Nong, 77 ± 5); (Non-Hung, 52 ± 2); (Vinh, 55 ± 3). The average for the five tektites is 57 ± 12. Figure 1 shows these results and others from the literature [1,6]. Average ^{10}Be contents of Muong Nong-type tektites are ~1/3 and ~1/2 those of Australian tektites and splash-form indochinites, respectively.

Discussion: The high ^{10}Be concentrations in Australites indicate formation from near-surface deposits. The lower ^{10}Be contents of southeast Asian tektites may reflect decay in an older source (^{10}Be half-life = 1.5 Ma), dilution by ^{10}Be-poor bedrock, a smaller proportion of adsorptive sediments, or a higher proportion of large grains.



Low ^{10}Be in the one-crater model: Typical long-term deposition rates for plausible impact sites such as an alluvial fan or a major delta are cm/ky [8], implying column heights of ~25-250 m, i.e., depths marginally consistent with a likely crater depth of 2 km. Discontinuous deposition would, however, allow smaller column heights.

Dilution of a ^{10}Be-rich surface component with ^{10}Be-poor bedrock could also explain the observed range of ^{10}Be contents. For surface materials and bedrock that contain, respectively, ~200-1000 × 10^6 and ~10 × 10^6 atom/g, we infer an admixture of at least 70% bedrock in layered tektites and 35% in Indochinites. Crater formation occurs within a few tens of seconds [9], leaving little time to produce uniform mixing of melts from different depths.

The lowering of ^{10}Be in Muong Nong-type tektites could reflect meter-scale heterogeneities like those seen in depth profiles of North China loess and other materials [2,3]. In this picture, we either attribute the lower ^{10}Be to chance or postulate that proto-Muong-Nong grains come preferentially from certain low-^{10}Be layers (e.g., loess), while other tektites contain more high-^{10}Be material (e.g., paleosols).

Finally, we note that by virtue of their higher surface to volume ratios, larger sedimentary grains contain less ^{10}Be per unit mass than smaller ones (e.g., [2]). Perhaps the Muong Nong-type tektites formed preferentially from larger grains.

Low ^{10}Be in the many-crater/melt-sheet model: The overall homogeneity of the ^{10}Be contents in Muong Nong-type tektites indicates either that the target material was everywhere fairly similar or, less likely, that the formation process efficiently mixed the ejecta from different impacts. The mixing arguments made above for the one-crater hypothesis apply here as well.

References: [1] Tera F. et al. (1983) *Carnegie Inst. Wash., Dept. Terr. Magnetism Yearbook,* 463–466. [2] Gu Z. Y. et al. (1997) *GCA, 61,* 5221–5231; Gu Z. Y. et al. (1996) *EPSL, 144,* 273–287. [3] Brown L. (1987) *Phil. Trans. R. Soc. Lond., A323,* 75–86; Pavich M. J et al. (1987) *GCA, 50,* 1727–1735; Brown E. T. et al. (1992) *GCA, 56,* 1607–1624. [4] Taylor S. R. (1996) *Meteoritics and Planet. Sci., 31,* 4–5; Koeberl C. (1992) *GCA, 56,* 1033–1064; Fiske P. S. (1996) *Meteoritics and Planet. Sci., 31,* 36–41; Schnetzler C. C. (1992) *Meteoritics, 27,* 154–165; Blum J. D. et al. (1992) *GCA, 56,* 483–492. [5] Wasson J. T. et al. (1995) *JGR, 100,* 14383–14390. [6] Raisbeck et al. (1988) *Chem. Geol., 70,* 120; Pal D.K. et al. (1982) *Science, 218,* 787-789. [7] Wasson J.T. (1991) *EPSL, 102,* 95–109; Fiske P. S. et al. (1996) *Meteoritics and Planet. Sci., 31,* 36–41. [8] Miall A. D. (1996) *The Geology of Fluvial Deposits,* Springer, p. 62. [9] Melosh H. J. (1989) *Impact Cratering,* Oxford, N.Y., p. 123.