

**Regional variations of trace element composition within the Australasian tektite strewn field.** H. Huber and J. T. Wasson, Institute of Geophysics and Planetary Physics, University of California, Los Angeles, Los Angeles, CA, USA, hhuber@ucla.edu.

**Introduction:** The Australasian tektite strewn field is the largest of the four known strewn fields of tektites on earth. Although numerous modeling attempts have been made within the last 4 decades, there is still the question remaining, how they were formed and where the associated impact [1-3] has happened. Various models of formation were established including lunar origins, one or multiple terrestrial impact sites [4], and aerial burst deposits [5]. The Australasian strewn field is the youngest with an age of 770 ka and appears to be somehow special compared to the others. At this place all possible features of tektite shapes such as layered, splash, and ablated splash-form tektites and microtektites are found – at all other fields some types are missing. Nevertheless, since the source crater is still missing the formation remains enigmatic. One of the key features are layered tektites since these underwent lower formation temperatures and have significantly different size and shape [6]. The splash-form tektites are widely distributed throughout Southeast Asia, Indochina, and Australia. Microtektites are found in deep-sea drill cores in the Pacific Ocean, Indian Ocean, and the South China Sea covering ~10% of the Earth's surface. In a recent study the Australasian microtektite strewnfield was differentiated in the already known groups of high-Ca and high-Mg, and a new high-Ni group [7]. The purpose of this study was to determine the regional differences to help constrain the different mechanisms of the tektite-producing event.

**Analytical technique:** We include the results of several irradiations; overall 48 layered tektites from Vietnam, Thailand, Laos, Cambodia, and Hainan island. These data are compared with 12 splash form tektites from Southeast Asia (Guang Xi China, Thailand, Vietnam), 2 Billitonites, 2 Indochinites, 4 Phillipinites and 10 Australites. The method of choice was instrumental neutron activation analysis (INAA). Solid slabs of ~3 mm thickness were irradiated at the TRIGA Marc I reactor of the University of California, Irvine for four hours at a neutron flux of  $1.8 \cdot 10^{12} \text{ cm}^{-2} \text{ s}^{-1}$  together with standard reference material (Cody shale rock powder Sco-1). All samples were counted in four cycles using high-resolution gamma-ray detectors [8].

**Results and Discussion:** The major and trace elemental compositions are within analytical uncertainty ranges with available literature data.

The regional differences of Ca and Sr are in good agreement with the enrichment of  $^{10}\text{Be}$  in Australasian tektites [9, 10]. The high  $^{10}\text{Be}$ -contents suggest that a large component of the target material consisted of near surface sediments. In superficial soils caliche is found throughout Southeast Asia. The enhanced concentrations of Ca and Sr in the Australites could then be explained as presence of caliche within the target material. We were initially surprised to find a Zn enhancement in the Australites, but Zn is also enriched in caliche [11].

The other volatiles Ga, As, or Sb show no variation within analytical uncertainties. The same can be observed for the rare earth elements. They have all patterns equivalent to terrestrial upper crust, and are undistinguishable for the different groups of tektites and microtektites. In general, the layered tektites can be easily distinguished due to their higher contents in volatile elements compared to the other forms. The Ga vs Sr diagram (Figure 1) leads to a tentative separation of the different tektite groups on the basis of formation conditions (high-low temperature) and origin of target material (top or lower surface).

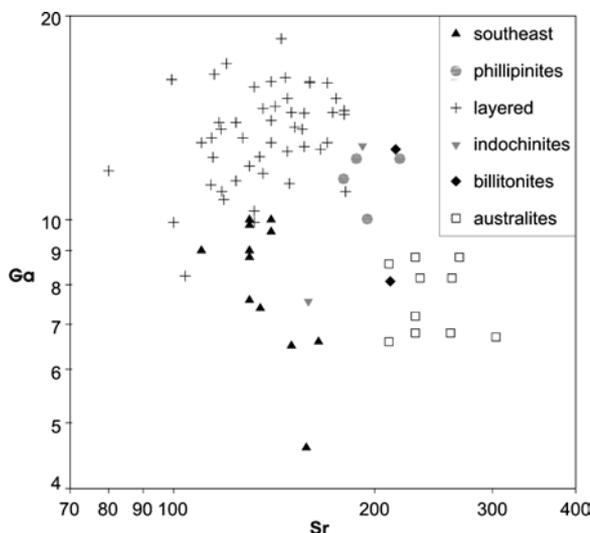


Figure 1.

Comparing the Ni, Co, and Cr contents leads to a completely different picture. The highly siderophile elements show enrichments with no distinct regional variation. The Cr-Ni diagram (Figure 2) shows two different groups of target material, one of upper crust material and a second ultramafic component. The latter

component has already been described [4], but seems inconsistent with a single target model as proposed by [12].

*schmidt Conf. 11*, Abstract#3667. [12] Blum J.D. et al. (1992) *GCA* 56, 483-492.

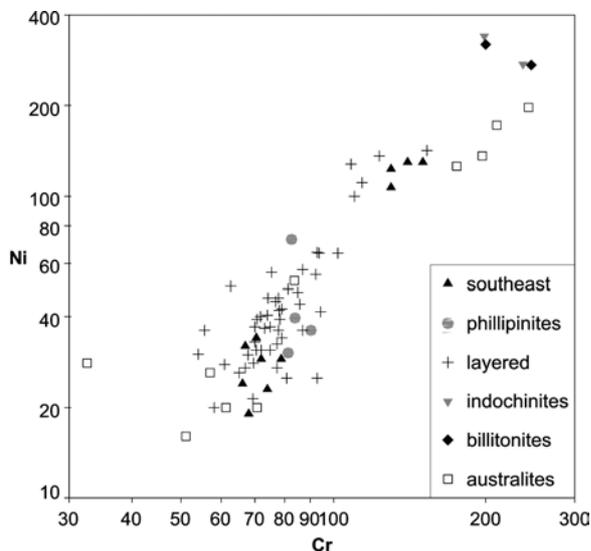


Figure 2.

The Ni vers Sr variation leads to the separation of the Billitonite and Indochinite-samples from the rest. They have Ni-contents twice as much as the other tectites and show the same distribution as the high Ni microtektites described by [7].

**Conclusions:** The regional variations in trace elemental composition of Australasian tectites can be traced to differences in formation and target material. Nevertheless, the complex formation mechanism of the Australasian tectite strewn field is still unsolved. A simple single impact event can be excluded, since the products of the tectite-forming event are highly variable concerning size, shape and chemical composition. Further investigations concerning necessary conditions to launch the tectites from the ground to the actual sampling sites have to be done.

**References:** [1] Hartung J. and Koeberl C. (1994) *Meteoritics* 29, 411-416. [2] Lee M.-Y. and Wei K.-Y. (2000) *MAPS* 35, 1151-1155. [3] Glass B.P. (2003) *LPS XXXIV*, Abstract #1092. [4] Wasson J.W. (1991) *EPSL* 102, 95-109. [5] Wasson J.W. (2003) *Astrobiology* 3, 163-179. [6] Koeberl C. (1992) *GCA*, 56, 1033-1064. [7] Glass B.P. et al. (2004) *GCA*, in press. [8] Kallemeyn G.W. and Wasson J.T. (1981) *GCA* 45, 1217-1230. [9] Ma P. et al. (2001) *LPS XXXII*, Abstract #1351. [10] Aggrey K. et al. (1998) *MetSoc* 61, Abstract#5142. [11] McCall K. et al. (2001) *Gold-*