Agglutinated Australasian Tektites. A. Krauss[1], [1]Doctor of Engineering, Consultant Engineer (andreas.krauss@krauss-engineering.de), A. Whymark[2], [2]Consultant Wellsite Geologist (aubrey@tektites.co.uk).

Introduction: In 2010 the primary author (1) purchased an unusual tektite (Fig. 1) from an online seller in China. The specimen is reportedly from Guangdong Province, China. Precise locality details are not known. The tektite is the only indisputably agglutinated macrotektite known to the authors. Suspected, but questionable, agglutinated macrotektites have previously been reported in indochinites (some also noted as coming from Guangdong Province) [1] [2] [3].

Fig. 1: Agglutinated macro-tektite from Guangdong, China. Size: 64 x 47 x 26 mm. Weight: 86 grams.

The agglutinated macrotektite in Figure 1 has the appearance of two plastically deformed plano/concavo-convex teardrops. The two agglutinated bodies are of different sizes, even allowing for spallation loss. The larger body partially engulfs the smaller one. Each has a tapered neck, which cooled faster than the bulbous body due to high surface area to volume ratio and hence avoided reabsorption. Posterior 'etched' flow lines can be observed in both agglutinated specimens, gently swirling in an anti-clockwise manner about the neck. The anterior surface is typical of most indochinites, being pock-marked in the central punt (anterior concavity) and surrounded by anterior margin spallation surfaces, also termed 'bald spots'. It is evident that the anterior surface of both specimens acted as one, indicating the bodies fused early on in the formation process whilst still molten on the exterior and prior to (completion of) the plastic deformation stage.

The probability of two teardrops coming together in such a perfect fashion seems improbable, but not impossible. With reference to Figure 2, it is theorized that the two apparent teardrops may, in actuality, be an asymmetrical dumbbell. The asymmetrical dumbbell would have stretched, due to centrifugal forces caused by rotation, to the point of almost splitting into two teardrops. If this were the case one would expect both bodies to have 'etched' flow line swirls in the same direction, which they do: Anti-clockwise in this case.

Instead of splitting, the thin neck of the asymmetrical dumbbell was contorted and bent. The two separate lobes came into contact and fused. It is then theorized that the body underwent, or continued to undergo, deformation due to atmospheric interaction. The two lobes flattened out to a discoidal morphology and a punt formed at the stagnation point (highest pressure). Once the majority of the inherited cosmic velocity was lost, the surface of the anterior margin was rapidly cooled in the frigid upper atmosphere and spalled to create ‘bald spots’.

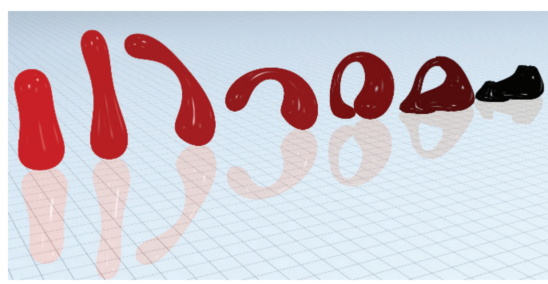

Fig. 2: A diagram demonstrating the possible formation mechanism of the tektite in Fig. 1.

Microtektites agglutinated to other microtektites, are termed 'agglutinated microtektites' (also referred to as accretionary microtektites, welded microtektites and fused microtektites). Agglutinated microtektites have been recognized since at least 1974 in the Australasian strewn field [4] [5] [6] [7]. It has also been suggested that Muong Nong-type layered impact glasses comprise welded microtektites [8], but this does not fit with current formation models and is refuted by [9] and others. Spherical grains in Muong Nong-type layered impact glasses are likely remnant detrital grains.

Fig. 3: Probable agglutinated microtektites on the posterior surface of an indochinite from Guangdong Province, China. Size: 71 x 60 x 22 mm. Weight: 106.1 grams.

Microtektites agglutinated to macro- or mini-tektites have not been formally recorded from the Australasian strewn field, but have been informally recognised for some time on the posterior surfaces of tektites from China [10]. They have not, so far, been observed on dumbbells, possibly due to lack of orientation. The apparent microtektites are not considered to be products of 'etching', e.g. resistant lechatelierite, as they are found only on well preserved lightly 'etched', not heavily 'etched', bodies. Further testing is required.

Proximal tektites from China (e.g. Fig. 3) can be compared with impactites such as irghizites and darwin glass. These very proximal tektite-like bodies readily exhibit fusion of micro- and mini-bodies. A fine comparison can be drawn with tektite-like irghizites (Fig. 4), which are recognised as having smaller glass spherules agglutinated to the surface [11] [12].

Within the Australasian strewn field, macrotektites with agglutinated microtektites are most regularly observed in well preserved proximal tektites advertised as coming from the Maoming (to be treated in the broadest sense) or more general Guangdong Province, China. This can be considered as the eastern part of the proximal strewn field. Provenance is usually extremely poorly established. It is speculated that the well preserved, very lightly etched / leached and minimally water transported, Chinese tektites may be derived from the shallow marine Beihai Formation of Hainan Island and the Leizhou Peninsula [13] or equivalent.

Well preserved tektites may have been deposited in a marine environment with limited / recent subaerial exposure. The good preservation is likely attributable to minimal transportation and abrasion together with suppression of leaching processes by sea water [14]. Comparisons might be drawn with the preservation of Port Campbell australites [15] [16]. This fine preservation is contrasted to tektites derived from localities such as the Khorat Plateau, Thailand, in the western part of the proximal strewn field. These often heavily pitted tektites have been subaerially exposed since formation (or incorporated in fluvial / alluvial deposits). They have lost most of the primary surface texture (including agglutinated microtektites) through abrasion and leaching processes in acidic ground waters.

Fig. 4: Agglutinated microtektites on an irghizite derived from Zhamanshin Crater in Khazakhstan. Size: 19 x 12 x 3 mm. Weight: 0.90 grams.

In conclusion, Australasian agglutinated tektites can be found in all size ranges. Further examination is required to establish whether agglutinated forms are more common in proximity to the source crater. Agglutinated microtektites are likely discrete unassociated bodies, but may be associated spatter, similar to spatter observed on the posterior of some oriented meteorites.

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