CAN LOESS BE A SOURCE MATERIAL FOR AUSTRALASIAN TEKTITES? M. Trnka[1], [1]Lithos Co., Ltd., Durdakova 41, 613 00 Brno, Czech Republic (trnka@lithos.cz).

Introduction: Loess is sometimes considered a potential parent material of tektites and microtektites of the entire Australasian (AA) strewn field [1-4]. These considerations are based on comparison of whole rock major element chemical composition of loess and tektites, sometimes even trace elements or isotopes of certain elements are taken into account. It should be noted, however, that other studies [5, 6] use different geochemical parameters to exclude the genetic link between loess and tektites.

The possibility of the origin of tektites from loess has not been confronted to local geological settings so far. The most probable site of the tektite-forming impact is placed to Indochina, in particular the region between 8-23° N latitude and 100-110° E longitude. Loess deposits in this area occur only locally forming island-shaped strata no more than 2 m thick. Slightly higher thicknesses are attained in basins where Mesozoic clastic sediments are deposited. However, even in these regions the thickness of loess deposits does not exceed 8 m [7-9].

Even more important than a limitation posed solely by thickness and spatial distribution of loess deposits in Indochina is their age. In this region, loess formed much later than in classical region of north China, particularly in colder and drier glacial periods resulting in reduction of forests extent, increased erosion and facilitating of eolian transport [10]. In the north part of this region, the loess formation is dated to 90–222 Ka [11], in the South, the age is possible even smaller (less than 40 Ka [12, 13]). The stratigraphic position of loess deposits above tektite-bearing sediments further corroborates these age limits. In Indochina, no tektites have been found in loess deposits or above them. Twenty-five years of fieldwork at hundreds of outcrops containing tektites allowed the author to confirm these observations undoubtedly. The tektite finds atop of lateritized basement below loess are mentioned already in the first paper on Muong Nong-type tektites [14] as well as in the later papers [15, 16].

Tektite-bearing strata overlay older, sometimes lateritized, basement. Lateritization took place in a short period before and after the fall of AA tektites. Sometimes, tektites lay atop of upper horizon of laterite profile, which is formed by pisolitic laterite. Obviously, the fall of tektites happened at the very late stage of lateritization. The cease of lateritization after the AA tektite formation is documented by iron oxide and hydrated oxide coatings on tektite surfaces. Duration of lateritization process is estimated to about 100 Ka by [17].

Loess deposits does not show any lateritization and were deposited after lateritic weathering terminated. Paleosurface formed by pisolitic laterite with tektites deposited in-situ positions or close to such depositional situation is preserved only sporadically. Much frequently, the upper part of laterite with tektites was transported by fluvial or colluvial processes over some distance before burial. The redeposition of tektites might occur at any time between the tektite fall and covering of the surface by loess depending on local geological settings; the redeposition might even be multiple. At the locality Buntarik, the age of the last redeposition is 143 Ka [18]. The observations summarized above indicate that loess deposits were not developed over the territory of Indochina at the time of tektite origin and consequently they cannot represent a parent material from which the tektite might formed.

The age of loess compared to that of tektites does not exclude these rocks as the tektite parentage only if tektite-forming impact would have occurred much more to the North, particularly in the central or northern China. In this region, the loess deposits commenced to form much earlier than in the region of Indochina, definitely before the origin of tektites. The tektite-forming impact was placed to this region by [4] though the hypothesis is in variance with all previous studies focused on locating the impact site based tektite morphology, variability in regional distribution of microtektites and unmelted ejecta, contents of crystalline phases in AA tektites, etc. They argued that AA tektites lack higher contents of Fe, Al, and some trace elements indicating the presence of laterite in source materials. At the same time, they claimed that the region of Indochina is covered by continuous and relatively thick horizon of lateritized rocks, which the impact would hit undoubtedly involving them to the tektite melt in addition to overlying loess.

Actually, the geological settings are completely different in Indochina. Thicker horizon of laterites occurs only locally at places suitable to lateritization, e.g., on more mafic substrates. In more geomorphologically ragged areas less suitable to lateritization, the denudation was much faster exposing weakly weathered bedrock to the surface. In the regions of south Laos and northeast Thailand, the Mesozoic rocks dominate displaying a horizon enriched in Fe and Al only a few tens centimeters thick or such a layer is even completely missing on their tops locally. In addition, formation of glassy phase, including tektites, from rock of a laterite character is taking into account Zachariasen's theory improbable in general. Likewise, these same structural principles may explain absence of lateritic component in Ivory Coast tektites and related microtektites, though their parent crater Bosumtwi is located in the region with substantial lateritization.

Loess as a source of AA tektites is also incompatible when rock fragments in unmelted or partly melted ejecta from a microtektite layer in drill cores in the Indian Ocean and in South China, Sulu, Celebes, Philippine Seas [19, 20] are considered. Loess consist of very well size-sorted grains with main modal value in the range 0.01 – 0.05 mm (e.g., [21, 22] and references therein). On the contrary, the grain-size in fragments of unmelted ejecta varies considerably commonly exceeding 0.2 mm. Assuming the conclusion of [20] that these rock fragments represent the material identical to source materials for AA tektites is correct, which hypothesis is perfectly consistent with the author’s opinion, the parent material was petrographically close to arkose/sandstone. Such rocks represent shortly transported material of fluvial origin most frequently.

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