



# Investigating possible Belize Tektites – Request of an Extended Database on Magnetic and Raman Spectroscopical Signature of Natural Glasses

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## Belize glass – tektite or ...?

Since 1992 findings of possible tektite glasses have been reported from Tikal region, Guatemala, and later from Belize, here most likely in situ. Therefore the existence of a Central American tektite strewn field was proposed [1,2]. Ages of between  $780 \pm 40$  and  $820 \pm 40$  kyrs have been determined for Belize glasses [3-5].

The radiometric age constraints are indistinguishable from the ages of the Australite-Indochinite tektite strewn field (~770 ka). However, additional investigations on Belize glasses reported different geochemical signatures in comparison to the Australite-Indochinite tektites [6-10]. Pantasma structure in Nicaragua was proposed as a possible impact crater [11]. The KT-B impact is therefore hypothesized as a double impact.

Several years ago we have started to develop an extended database on the Raman Spectroscopy signature of natural terrestrial and meteoritic glasses [12], including a first Belize glass sample [13]. Background were the findings of the Mars Phoenix mission, namely numerous in part highly magnetic spherules of still unclear origin and formation [14]. A likely impact or volcanic background was hypothesized.

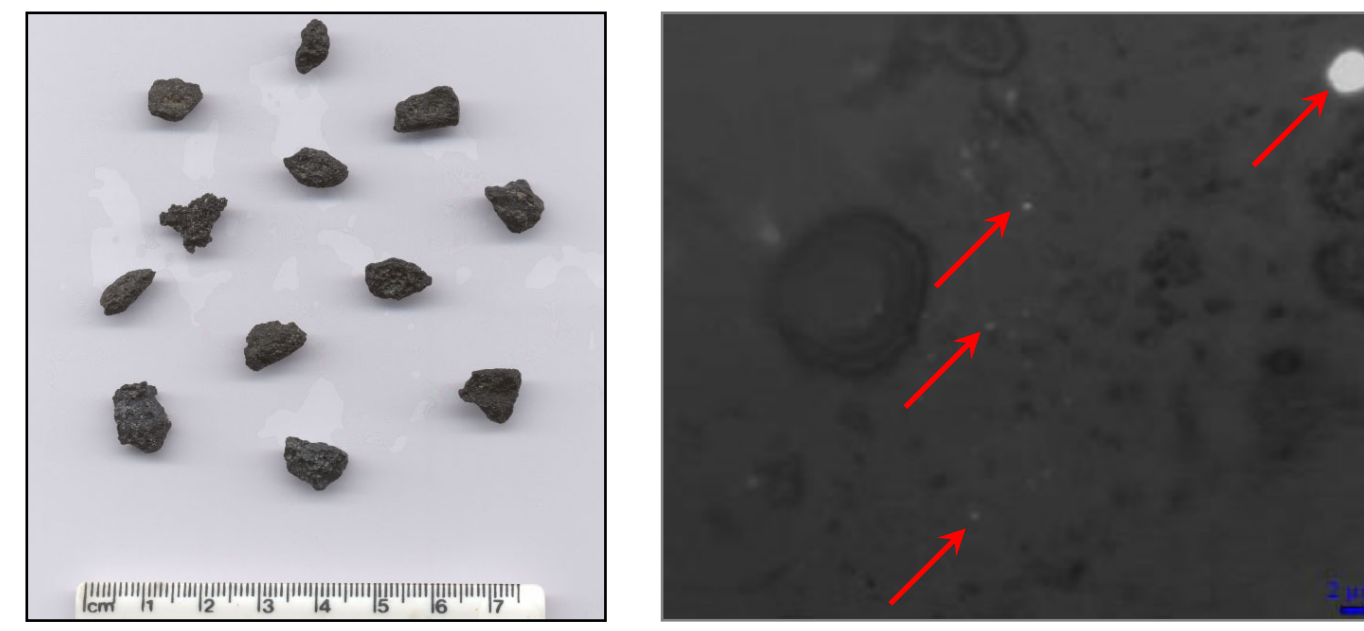


Fig. 1: (a) Belize glass (tektites?), (b) (sub-)micron-sized metal/oxide particles in Belize glass [13]. Scale: 2 µm.

	m (gr)	MS ( $10^{-9}$ m <sup>3</sup> /kg)	Log MS
Belize A	1.35	123.5	2.09
Belize 1	0.61	131.5	2.12
Belize 2	0.67	128.5	2.11
Belize 3	0.42	178.7	2.25
Belize 4	0.33	212.8	2.33
Belize 5	0.53	168.3	2.23
Belize 6	0.52	195.4	2.29
Belize 7	0.36	170.5	2.23
Belize 8	0.56	129.0	2.11
Range		123.5 – 212.8	2.09 – 2.33
Average		159.8	$2.20 \pm 0.05$

Tab. 1: Magnetic susceptibility (MS) of Belize glass.

Magnetic susceptibility values and therefore Fe-content of the investigated Belize glasses (fig. 1a) show significant variations which is not really typical for tektite glasses. These variations are also reflected by the magnetic remanence parameters of which, in addition, the absolute values are much higher than for all other investigated tektite glasses [13].

These facts point to a significant and varying content of ferro(i)magnetic micro-particles such as native iron or iron-oxides (which can carry a magnetic remanence), again not typical for (known) tektite glasses. Only very rarely iron-like micro-droplets are reported from tektites [Philippinites, 15]. We have found (sub-) micron-sized native Fe or Fe-oxide particles in Belize glasses (fig. 1b). Our new results on magnetics are in good agreement with earlier data [1 and refs.].

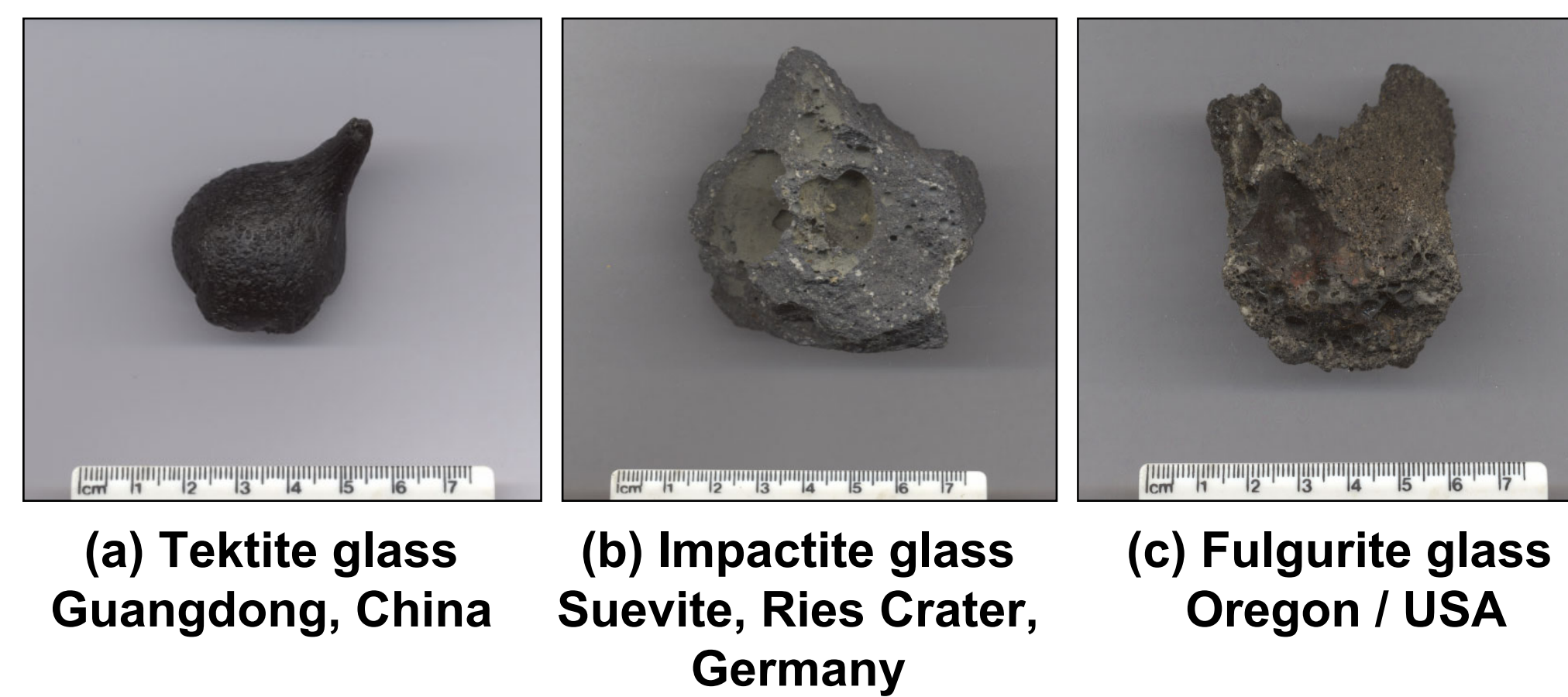
## Extended database of Magnetic Susceptibility (MS) of Natural Glasses

The most important result of our investigations was the clear requirement of an extended database based on a selected set of parameters of natural glasses: magnetic signature of natural glasses was never investigated systematically, and in parallel we decided to significantly extend our existing database on Raman Spectroscopical characteristics.

The focus of our investigations is a first step towards a larger database of the magnetic signature of natural glasses, whereby a selection of samples and data will be reported here.

The following types of natural glasses are included in our project which will significantly extend existing databases. Earlier studies are mainly focused on tektites, with only a few impactites/volcanites [15-17]:

- (1) Tektite glasses
- (2) Impactite glasses
- (3) Fulgurite glasses
- (4) Frictionite / hyalomylonite glasses
- (5) Volcanic glasses
- (6) Seismo - tectonic glasses



Figs. 2 a-f show a selection of natural glasses under study.



Table 2a-f: MS database of natural glasses, all data are new and original. Each reported sample represents a number of (sub-)samples of different size/mass, and log MS (in  $10^{-9}$  m<sup>3</sup>/kg) is the mean/average value of a number of (sub-)samples and measurements each. MS error is +/- 0.05.

(a) Tektites	MS / Log
Moldavites / Bohemia / Czech Republic	34 1.54
Moldavites / Moravia / Czech Republic	28 1.45
Moldavites / Lusetia / Germany	28 1.45
Moldavites / Eger Basin / Czech Republic	30 1.48
Muong-Nong Moldavites / Czech Republic	40 1.60
Ivory Coast Tektites / Ivory Coast	105 2.01
Bediasites / Texas / USA	92 1.97
Georgiites / Georgia / USA	34 1.51
China Tektites (various locations)	84 1.92
Muong Nong (layered) Tektites / Indochina	65 1.81
Thailand – Tektites / Thailand	86 1.94
Billitonites / Indonesia	78 1.89
Javaites / Indonesia	110 2.04
Philippinites / Philippines	86 1.94
Australites / Australia	82 1.91

## New MS results and interpretation in terms of Belize glass

## References

(b) Impactite Glasses	Log MS
Suevite Glass (bl) / Riescrater / Germany	2.52
Suevite Glass (br) / Riescrater / Germany	3.00
Lonar Impactite (Basaltic) / India	3.63
Lonar Impact Glasses / India	3.48
Zhamanshinite / Kazakhstan	2.27
Irghizite / Kazakhstan	2.08
Wabar Crater Glass / Saudi Arabia	3.11
Aouelloul Impact Glass /	2.66
Dakhla Impact Glass / Egypt	1.49
Lybian Desert Glass / Lybia	MS<0 (diamagn.)

(c) Fulgurite Glass	Log MS
Rock-Fulgurite Taymir / Siberia /Russia	3.28
Fulgurites Sahara / Lybia	3.56
Fulgurite Oregon / USA	3.50
Fulgurite Nevada / USA	3.15

(d) Frictionite / hyalomylonite glasses	Log MS
Pumice/glass (black) Koefels / Austria	3.11
Pumice/glass (light grey) Koefels / Austria	3.00
Hyalomylonite / Koefels, Austria	2.20

More on topic (d) will be reported elsewhere.

(e) Volcanic Glasses	Log MS
Obsidian / Little Lake / California / USA	2.32
Obsidian / Wyoming / USA	2.85
Obsidian (Mahagoni) / Georgia	2.75
Lamellar Obsidian (white) / Armenia	2.32
Lamellar Obsidian (black) / Armenia	3.10
Obsidian / Myvatn / Iceland	2.62
Dacitic Pumice / Haruna / Japan	4.38
Andesitic Pumice / Hekla / Iceland	3.13
Ash / Eyjafjalla eruption 2010 / Iceland	3.93
Ash / Grimsvotn eruption 2011 / Iceland	2.99
Pélée Hair / Hawaii / USA	2.44
Pélée Tear / Hawaii / USA	2.18
Reticulite / Hawaii / USA	2.28

(f) Seismo-Tectonic glasses	Log MS
Pseudo-Tachylites 1 / S-Bavaria / Germany	1.05
Pseudo-Tachylites 2 / Silvretta / Austria	1.90

A comparison of the magnetic susceptibility (MS) values of Belize glasses with MS of tektite, impactite, volcanic glasses seems to place the Belize glasses more to impactites. Also a volcanic origin of the source material cannot be excluded.

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