INVESTIGATING POSSIBLE BELIZE TEKTITES – REQUEST OF AN EXTENDED DATABASE ON MAGNETIC AND RAMAN SPECTROSCOPICAL SIGNATURE OF NATURAL GLASSES. V.H. Hoffmann[1,2], Kaliwoda M.[3], Hochleitner R.[3], M. Funaki[4], M. Torii[5]. [1]Faculty of Geosciences, Dep. Geo- and Environm. Sciences, Univ. Munich; [2]Dep. Geosciences, Univ. Tuebingen, [3]MSCM, Munich, Germany; [4]Tokyo, Japan; [5]Okayama, Japan.

Introduction

Since 1992 findings of possible tektite glasses havebeen 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 and 820 ± 40 ka 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 KTB impact is therefore hypothesized as a double impact.

Several years ago we have started to develope 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 [15]. A likely impact or volcanic background was hypothesized.

The most important result of was the clear requirement of an extended database based on a selected set of properties of natural glasses: magnetic signature of natural glasses was never investigated systematically, and we decided to significantly extend in parallel our existing database on Raman Spectroscopical characteristics. The focus of our contribution is a first step towards a database of the magnetic signature of natural glasses, whereby a selection of samples will be reported here.

Amongst others, the following types of natural glasses are under investigation in our project:

1. Tektites
2. Impactites
3. Volcanites
4. Tectonic glasses
5. Fulgurites
6. Frictionites / hyalomylonites

Tab. 1: MS of Belize glass samples, error in log MS is +/- 0.05.

	m (gr)	MS (10^{-9} m^3/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

MS values and therefore Fe-content of the investigated Belize glasses 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 other investigated tektite glasses [13]. This facts point to a significant and varying content of ferro(i)magnetic microparticles such as native iron or iron-oxides (which can carry a magnetic remanence), again not typical for (known) tektite glasses. Very rarely iron-like micro-droplets are reported from tektites [Philippinites, 15].

Tab. 2: MS database of natural glasses, all data are new and original: (a) tektites, (b) impactites, (c) volcanites, (d) Tectonic glasses (pseudotachylites), (e) fulgurites and (f) frictionites/hyalomylonites. Each reported sample represents a number of (sub-)samples of different size/mass, and log MS (in 10^{-9} m^3/kg) is 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
Tektites / China (various locationa)	84	1.92
Muong Nong (layered) Tektites / Indochina	65	1.81
Ivory Coast Tektites / Ivory Coast	105	2.01
Bediasites / Texas / USA	92	1.97

Georgiaites / Georgia /USA	34	1.51
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

(b) Impactites	Log MS
Suevite Glass (bl) / Riescrater / Germany	2.52
Suevite Glass (br) / Riescrater / Germany	3.00
Lonar Impact Rocks (Basalt) / India	3.63
Lonar Impact Glass / India	3.48
Zhamanshinite / Kazakhstan	2.27
Irghizite / Kazakhstan	2.08
Wabar Glass / Saudi Arabia	3.11
Aouelloul Impact Glass /	2.66
Dakhla Impact Glass / Egypt	1.49
Lybian Desert Glass / Lybia	MS<0 (dia-magn.)

(c) 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 / Eyjafjälla eruption 2010 / Iceland	3.93
Ash / Grimsvotn eruption 2011 / Iceland	2.99
Pelee Hair / Hawaii / USA	2.44
Pelee Tear / Hawaii / USA	2.18
Reticulite / Hawaii / USA	2.28

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

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

(f) Frictionites / Hyalomylonites	Log MS
Pumice (b) Koefels / Austria	3.11
Pumice (w) Koefels / Austria	3.00
Hyalomylonite / Koefels, Austria	2.20

Our new database will significantly extend existing databases of magnetic signature of natural glasses, mainly focused on tektites and/or impactites [15-17].

Comparing Belize glass MS with tektite or impactite MS signature seems to place Belize glass more to impactite glasses.

References

[1] Povenmire H. et al., 2011. 42nd LPSC, #1224. [2] Cornec J., Cornec L., 2010. The Sequel. [3] Povenmire H. et al., 2012. 43rd LPSC, #1260. [4] Schwarz W.H. et al., 2012. Paneth Coll., #0210. [5] Gantert N. et al., 2012. Paneth Coll., #0190. [6] Povenmire H., Cornec J., 2015. LPSC, #1132. [7] Schwarz W.H. et al., 2013. LPSC, #1888. [8] Giuli G. et al., 2014. LPSC, #2322. [9] Koeberl C., Glass B.P., 2014. Metsoc, #5034. [10] Koeberl C., Wegner W., Glass B.P., 2015. Metsoc, #5320. [11] http://www.pantasma.com. [12] Hoffmann V.H., et al., 2013. NIPR Antarctic Meteorite Conference, abstract. [13] Hoffmann V.H. et al., 2013. LMIPE V., #3086. [14] Goetz M. et al., 2010. J. Geophys. Res., 115, E00E22. [15] Senftle F.E., Thorpe A., 1959. GCA 17, 234-247. [16] Werner T., Borradaile G.J., 1998. PEPI 108, 235-243. [17] Rochette P. Et al., 2014. Metsoc, #5040.

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