OPTICAL AND SPECTROSCOPIC STUDY OF NATURAL GLASSES

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Three samples of natural glasses from the Mineralogy Museum of the "Babes-Bolyai" University of Cluj-Napoca were studied by optical microscopy (OM) in plane-polarized light on thin sections, infrared spectroscopy (IR), X-ray powder diffraction (XRD) and electron microprobe analysis (EMPA). The samples were: (A) *obsidian* – a black volcanic glass originating from Armenia, (B) *lechâtelierite* – a glassy, colourless layer formed by thunder impact at the surface of Late Jurassic rhyolites from the Apuseni Mountains (Romania) and (C) a yellowish-greenish translucent *Lybian Desert Glass* (LDG) of unknown origin.

OM for obsidian shows an isotropic glassy mass, with typical flow structure, and containing crystallites as well as monophasic inclusions. The lechâtelierite presents the porphyritic texture of rhyolite, with rare plagioclase phenocrysts and a microcrystalline-vitreous groundmass, being surface covered by a 0.5 mm layer of isotropic glass. In the isotropic mass of LDG appears numerous irregular-shaped mono-, bi- and polyphasic inclusions and elongated gas bubbles.

FT-IR absorption spectra of the three samples are similar and quite close to glassy SiO_2 spectra. The presence of the characteristic well-resolved band in the 1050-1100 cm^{-1} interval is assigned to the Si-O vibrations, while the band occurring around 800 cm^{-1} is attributed to the vibrations of isolated $[SiO_4]^{4-}$ tetrahedra. The broad, weak band around 3500 cm^{-1} is due to the low amount of OH^- groups present in the glass structure.

EMPA results presented in Table 1 reflect the composition of the glasses parental materials, rhyolitic lava for the Armenian obsidian, rhyolitic rock for the Romanian lechâtelierite and quartzitic sand for the LDG. The high amount of carbon in the Romanian glass might come from vegetal matter which covered the rock surface before the thunder beat.

Table 1. Oxide compositions calculated from EMPA dates (% wt.)

Oxides	Obsidian (Armenia)	Lechâtelierite (Romania)	Impactite (Lybia)
SiO_2	75	67.43	96.14
Al_2O_3	14.93	8.09	3.08
$Fe_2O_3^*$	1	1.32	0.39
TiO_2	0.18	1.28	0.23
CaO	0.87	-	-
MgO	-	0.60	0.08
Na_2O	4.43	5.39	0.05
K_2O	3.57	5.87	-
C	-	11.13	-
Total	100	100	100