

Petrology and magnetic characterization of molten glass samples found at Northern Atacama Desert, Chile: testing their impact origin.

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Discovery and first characterization: On 2011, senior geologists at the Chilean National Survey, found exposed deposits of green molten glasses in the Central Depression of northern Atacama Desert, Chile. According to them [1], the glass layers are distributed in an area of ca. 65 km long, in isolated and fragmented tabular bodies, with ellipsoidal shapes of 2-4 m of diameter and 15-25 cm thick. The rocks correspond to green, highly vesiculate glasses, with irregular forms, that present different degrees of fusion of the underlying sediments, mainly composed by sands and clays from a paleowetland deposit dated by ¹⁴C in 12400 ± 70 y. Some samples, studied under the microscope, showed neoformed crystals and relict quartz with planar deformation features (PDF's). They also found baked clay layers. First paleomagnetic characterization done in oriented samples by our team [2], found highly stable remanent magnetization and magnetic evidences that indicates the soil was heated *in situ* above 700°C (>10 cm depth). Fulgurite, metallurgic scoria and volcanic origin where ruled out by different criteria [1, 2].

Methodology: New thin and polished sections were prepared for optical and electronic microscopy. We obtained mineral and glass chemistry using microprobe and measured magnetic susceptibility in centimeter fragmented samples to select the most magnetic ones in order to characterize their magnetic minerals doing hysteresis loops.

Results: The samples are characterized by high heterogeneity ranging from almost completely molten ones, where green, transparent glass is preserved showing fluid textures, to others with many relict clast, some with reaction borders, and dirty glass. Glass recrystallization to melilite and/or clinopyroxenes is common, and the opaques phases are dominated by iron sulphides (~FeS), not obiquitously present, and phosphides in a less amount. Studied samples didn't have PDF's in quartz grains, but planar fractures were found. Magnetic susceptibility is low in most samples, and the stronger values are associated with eolian magnetite particles trapped in vesicles.

Future work: Parallel studies will attempt Ar-Ar datation of the glass and its chemistry. New field trips are programmed to constraint glass and mineral phase's distribution and study a possible impact structure proposed by the discoverers.

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References: [1] Blanco et al. 2012 Servicio Nacional de Geología y Minería, Registered inform N° IR-12-50, Santiago, Chile; [2] Roperch et al. 2015. Abstract for the PMag Colloquium, Aix en Provence, France.