

**NEW FINDINGS BY RAMAN MICROESPECTROSCOPY OF INCLUSIONS INSIDE A LIBYAN DESERT GLASS.** J. Aramendia<sup>1</sup>, L.Gomez-Nubla, S. Fdez-Ortiz de Vallejuelo, K. Castro, and J. M. Madariaga  
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Libian Desert Glass (LDG) has been a mystery for scientist since its discovery in 1932. LDG is a natural glass that is scattered in the Western Desert of Egypt, near the Libyan border. It is estimated to be 28.5 million years old. There is a controversy around the genesis of these glasses. Apparently, they could be created by an impact process or by an airburst [1]. The large volume of the glass and its very high silica content led to the assumption that it formed by shock-melting of quartz sand and/or sandstone during a meteorite impact [2]. This hypothesis would be argued because of the crater absence. Some scientist affirm that depends on the chemical composition of the LDG it could be known the origin of the glass [3].

Several works studied the composition of LDG, but only a few of them were carried out using Raman spectrometry. This work shows new information about the mineral composition of the inclusions present in LDG.

In this work two samples of LDG were analyzed. The analysis of the samples were carried out with two Raman spectrometers: InnoRam ultramobile B&WTEK<sub>inc.</sub> and Renishaw InVia Raman espectrumeter coupled to a DMLM Leica microscope. The last equipement has a 514 nm and a 785 nm excitation laser. In order to complement the information obtained from Raman spectra it was used a portable ArtTax X-ray micro-fluorescence equipment ( $\mu$ -XRF) by Brucker.

According to Raman data, it has been possible the determination of LDG matrix, supposedly a glassy matrix ( $\approx 1370\text{ cm}^{-1}$ ,  $\approx 1600\text{ cm}^{-1}$ ). This result differs from the data found in other studies that affirm that the bulk material is formed of glassy matrix but with broad Raman bands around  $480\text{ cm}^{-1}$  and  $820\text{ cm}^{-1}$ . With this technique different inclusions were identified, such as: quartz ( $\text{SiO}_2$ ), anatase ( $\text{TiO}_2$ ), calcite ( $\text{CaCO}_3$ ),  $\text{Na}_2\text{CO}_3$  and carbonaceous matter (Fig.1). In the case of these samples of LDG the brownish inclusions are composed of pure quartz, with Raman bands 204(m), 263(s), 354(s), 401(vs), 463(vs), 695(vs), 806(s), 1081(vs), 1158(vs)  $\text{cm}^{-1}$ . With regard to the calcite, it was not identified in other LDG studies and this compound could be related with the anhydrite found in other publications [4]. Another compound has been found by Raman spectroscopy, with bands at 513 and  $529\text{ cm}^{-1}$ . According to literature it could be a microcline feldspar.

The elemental composition of LDG obtained by using the XRF, where the main elements present in the

samples are: Si, S, K, Ca, Ti and Fe, would be consistent with the molecular composition obtained by Raman spectroscopy.

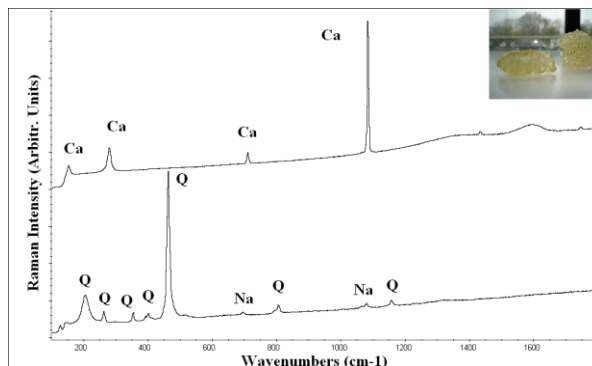


Figure 1. Raman spectra of calcite (Ca), Quartz(Q) and sodium carbonate (Na) found in LDG.

Compound	This study (Wavenumber/ $\text{cm}^{-1}$ )	Other LDG studies (Wavenumber/ $\text{cm}^{-1}$ )
LDG matrix	Silicate: $\approx 1370(\text{br})$ $\approx 1600(\text{br})$	Glassy matrix: 480(br) 820(br)
Quartz ( $\text{SiO}_2$ )	204(m) 263(w) 354(w) 401(vw), 463(vs) 806(w) 1158(vw)	208(w) 465(m)
Anatase ( $\text{TiO}_2$ )	143(s)	142(vs) 227(vw) 395(vw), 515(vw) 637(w)
Calcite ( $\text{CaCO}_3$ )	153(w) 279(m) 710(w) 1085(vs)	Not Found
Sodium carbonate ( $\text{Na}_2\text{CO}_3$ )	695(vw) 1081(w)	Not Found
Anhydrite ( $\text{CaSO}_4$ )	However Not Found	418(vw) 1018(vs) 1130(w)
Amorphous carbon	$\approx 1300(\text{br})$ $\approx 1600(\text{br})$	$\approx 1300(\text{br})$ $\approx 1600(\text{br})$
Microcline feldspar	513(m) 529(m)	Cristobalite, etc

## References

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