"IN SITU" STUDY OF A COLLECTION OF 20 METEORITES USING RAMAN SPECTROSCOPY

Th. Katsaros[1] and Th. Ganetsos[1,2]
[1]Byzantine & Christiane Museum (Gr.) Laboratory of Gemstones (Vasilissis Sofias Ave. 22 Athens 10675 Greece tkatsaros@rhodes.aegean.gr),
[2]T.E.I. of Lamia, Department of Electronics (3rd Km O.N.R. Lamia-Athens, Lamia, 35100, Greece).

We investigate the ability to determine the mineralogical character of 20 samples of different meteorites from a private collection by the using of a portable Raman apparatus [6] not in the Laboratory.

We use the Rockhound Deltanu Raman spectrometer (Fig. 1a and b) (Laser: 120mW, 785nm, Resolution: 8 cm^{-1}). The samples which we studied are, Pallasites: 2 samples from Brahin (Russia), 3 samples from Brenham (USA), 1 from Thumrayt 001 (Sultanate of Oman), another group is the stony iron meteorites such as Drofar 020 and Chubara both from Sultanate of Oman. We investigated 2 samples of Moldavites from Czech Republic, one Tektite (Thailandite). The other meteorites which we made measurements are one sample from the following: Chondrite H5 from Chergach (Mali), Allende CV3 from Mexico, Octahedrite from Muonionalusta (Sweden), Octahedrite IA from Odessa Texas (USA), Octahedrite IIAB from Shikote-Alin Siberia (Russia), Ataxite from Santa Catherina (Brazil), Iron-IC meteorite from Bendego (Brazil), Ataxite from Dronino (Russia), Iron IIAB Campo del Cielo (Argentina), Medium Octahedrite from Nan-Tan (China), IAB-MG from Canyon Diablo, Arizona (USA), Gibeon (Namibia) and NWA-869 Stony Meteorite from Algeria (North Africa).

We well testified with Raman the characteristic presence of Olivine in the texture of Pallasites from Brahin and Brenham. [1-3] We observed a strong fluorescence in the sample from Allende CV3 which probably derived from its heating by the fall of it in the atmosphere. The characteristic Raman behavior of the glassy mass of Moldavites has well observed.

The Raman spectra of the olivine-group minerals have a characteristic set of two intense lines of the Si-O asymmetric stretching band (wavenumber κ1) and Si-O symmetric stretching band (κ2).[4-5] The κ1 and κ2 values of the Mg_2SiO_4-$Ca(Mg, Fe)SiO_4$ series, in which the M2 site is occupied by nontransition elements, vary from 847 cm^{-1} to 857 cm^{-1} and from 815 cm^{-1} to 825 cm^{-1}, respectively [6] Fig. 2 represents the experimental results in very good agreemtn with bibliography. We testified the presence of the mineral phase of Troilite in the case of the meteorite sample from Campo del Cielo and on the surface of the sample from Muonionalusta. We observed also the characteristic Raman spectrum of Nickel in the samples of Iron-Nickel meteorites such as Canyon Diablo, Gibeon, Sikhote Alin. Last but not least we propose the application of the portable Rockhound Deltanu Raman spectrometer on the primary investigation of the samples In Situ of its plase of finding. It is very important for a field researcher scientist to understand the identification of an unknown material as a first approach using a non-destructive technique.

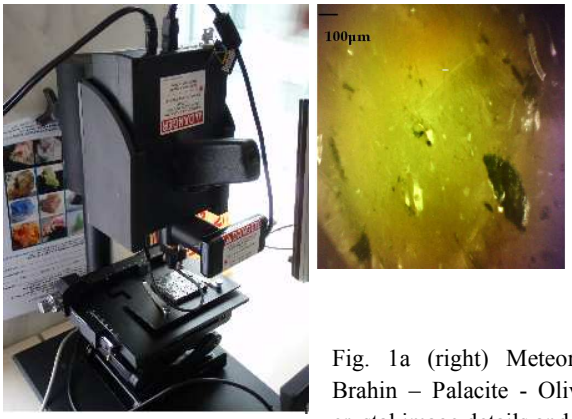

Fig. 1a (right) Meteorite Brahin – Palacite - Olivin crystal image details and b (left) Rockhound Deltanu Raman Spectrometer

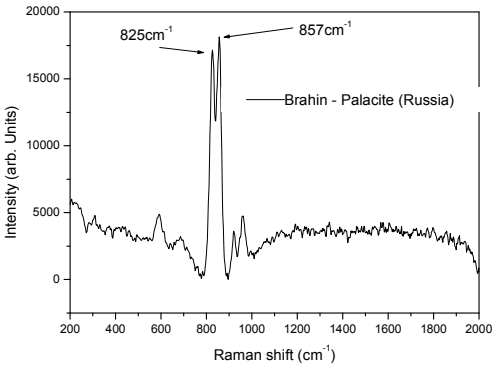

Fig. 2 Raman spectrum of the meteorite Brahin (Russia)

References

[1] Kolesov B A, Geiger C A (2004), *Physics and Chemistry of Minerals*, *31*, 142-154.
[2] Mouri T, Enami M (2008), *Journal of Mineralogical and Petrol. Sci.*, *103*, 100-104.
[3] Katsaros Th. et al. (2007), *GSA, Ann. Meet.*, *6*, 574.
[4] Kolesov B. A., Tanskaya J. V. (1996), *M.R.B.*, *31*, 1035-1044.
[5] Mikouchi T., Miyamoto M. (2000) *Meteoritics & Planet. Sci.* , *35, 1*, 155–159
[6] Mouri T. and Enami M. (2008) *J.Min. and Petr. Sci.*, *103*, *2* , 100-104.