

## Spectroscopic investigation of Mahadevpur H4/5 ordinary chondrite

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We report here for the first time the Fourier-transform infrared (FTIR), Laser-Raman, X-ray fluorescence (XRF) spectroscopic investigations of the Mahadevpur H4/5 ordinary chondrite that fell at Mahadevpur, India, on 21 February 2007, 9:10hr.(IST)[1]. Particular interest is given on the 10 $\mu$ m (1000cm<sup>-1</sup>), 20 $\mu$ m (500cm<sup>-1</sup>) and 3.4 $\mu$ m (2800– 3000cm<sup>-1</sup>) region of IR spectra. The major IR and Raman bands observed in 500-1000cm<sup>-1</sup> region is due to olivine group. In olivine group [(Mg,Fe) SiO<sub>4</sub>], the SiO<sub>4</sub><sup>4-</sup> tetrahedra are isolated in the structure and linked by cations Fe<sup>2+</sup> or Mg<sup>2+</sup> in octahedral positions. The effect of by cations Fe<sup>2+</sup> (r = 0.74Å) or Mg<sup>2+</sup> (r = 0.66Å) in octahedral positions of olivine group in the meteorite sample has been investigated. The special interest is given in systematic band shifts in forsterite- fayalite series. The optical density and extinction coefficient of the meteorite sample has been calculated using standard relation. The trace of aliphatic functional groups (CH<sub>2</sub> and CH<sub>3</sub>) is found in the spectral region around 2800-3000cm<sup>-1</sup>, which is important to Astrobiology. The XRF and EPMA data were collected as described by Bhandari *et al.* [2], Dhingra *et al.* [3]. Raman spectrum is recorded using a Perkin-Elmer System 2000 FTRaman spectrometer. The mineralogical composition of this meteorite is: olivine (Fo80.8 Fa19.3), orthopyroxene (En81 Fs17 Wo1) and clinopyroxene (En58 Fs8 Wo35).

[1] Weisberg *et al.* (2008) *Meteoritics & Planetary Science* **43**, 1551–1588, [2] Bhandari *et al.* (2005) *Meteoritics & Planetary Sciences* **40**, 1015-1021. [3] Dhingra *et al.* (2004) *Meteoritics & Planetary Sciences* **39**, A121-132.

## Study of micro-crystallinity of SiO<sub>2</sub> in two Indian Fulgurites

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At this high temperature silica of soil or rocks melts and passes through a relatively rapid cooling which causes the glass to solidify. Fulgurites are appreciated as having value in the interpretation of melts formed during meteorite evolution, re-entry, and meteorite impact [1-3]. The core of the fulgurite is more silica-rich with comparison to its branches. This variation could be due to the melt processes, vaporization and condensation of silicates in the core, quenching processes, and devolatilization processes. The unmelted gains of the host soil/rocks embedded into the outside of the fulgurite. Unmelted and partially melted quartz gains can be observed within the fulgurites. The appearance of residual micro-crystalline quartz in the sample throws light on the temperature of fusion of the formation. At high temperature and pressure, silica polymorphs pass through a slow reconstructive recrystallization, during which existing Si–O bonds are broken and new bonds are made to allow atoms to move to appropriate positions in the more stable polymorph. The structure of most SiO<sub>2</sub> polymorphous, both crystalline and amorphous, is based on SiO<sub>4</sub> tetrahedra. Amorphous silica is one of the polymorphous of silica and at high temperature it can easily transform from quartz. The present investigation we report the optical properties and micro-crystallinity of micro particle of SiO<sub>2</sub> in two Indian glassy fulgurites samples by comparing the ratio of intensity of the characteristic IR peaks at 10 $\mu$ m (1000cm<sup>-1</sup>) and 20 $\mu$ m (500cm<sup>-1</sup>) region. The investigation is based on powder X-ray diffraction (XRD), X-ray fluorescence (XRF) and Fourier-transform infrared (FT-IR) spectroscopic methods. The crystallinity parameter is calculated by using a standard procedure which can be used to estimate the distribution of micro crystalline SiO<sub>2</sub> in fulgurites.

[1] Weeks *et al.* (1980) *J. Non-Cryst. Solids*, **38**, 129-134. [2] Essene & Fisher (1986) *Science*, **234**, 189-193. [3] Wasserman *et al.* (2002) *LPSC XXXIII*, abs. 1308.