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Nature of the emission band of Dergaon meteorite in the region 5700–6700 Å

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Abstract. An emission band system in the region 5700–6700 Å from Dergaon stoney iron meteorite which fell at Dergaon, India on March 2, 16.40 local time (2001) was excited with the help of a continuous 500 mW Ar^+ laser. The band system is attributed to silicate (olivine), a major component of the meteorite.

Keywords. Dergaon meteorite; emission; interstellar dust.

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1. Introduction

Recently some spectroscopic investigations of the Dergaon meteorite [1,2] with reference to 10 μm and 20 μm bands have been presented. The salient feature of the work is the observation of 10 μm (1000 cm^{-1}) and 20 μm (500 cm^{-1}) bands in the middle infrared region. These bands originate from the valence vibration of SiO_4, a basic component of the silicate lattice. Likewise a wide absorption band at 6150 Å is also observed. These bands are considered significant because in the interstellar space the wide absorption bands were earlier detected in the middle infrared at 10 μm and 20 μm wavelengths [3,4]. These bands are identified as the valence vibrations or deformation vibrations respectively of the SiO_4 tetrahedron in silicates occurring probably as a component of interstellar dust. Measurements made on α-Orionis [5] revealed clues that 20 μm band in emission was present. Similarly 10 μm band in emission was found in a number of supergiants and giants [6]. According to a hypothesis, interstellar dust is a by-product of star formation or the 'building waste' of planetary systems. Some bodies of solar system like meteorites and comets produce even today dust particles obtained by collisions and other splitting up processes which may reach the intersteller space. In this communication we report an emission band system originating from the Dergaon stoney iron meteorite [2].

2. Experimental

The emission (or the laser-induced fluorescence) is recorded on a glass spectrograph. The source of excitation is a 500 mW Ar^+ laser. The finely powdered sample after the removal of the iron part by a magnet is kept between two firmly held glass plates. The optical path or the specimen thickness is 0.05 cm. Commercially available colour film is used to photograph the spectrum.

3. Results and discussion

Figure 1 demonstrates the general feature of the emission band system in the region 5700–6700 Å along with the Ar^+ lasing line at 5145 Å. The emission band system and its densitometer tracing as shown in figure 2 indicate the diffuse nature of the emission. Survey of available literature indicates that the laser-induced emission from a meteorite sample is the first report of its kind. The emission system would seem to characterize silicate. In [2], 10 μm and 20 μm silicate bands have already

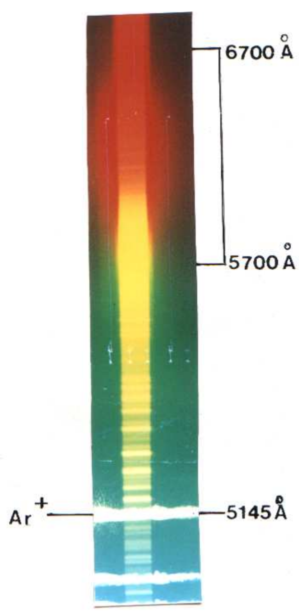

Figure 1. Laser-induced emission spectrum of Dergaon meteorite in the wavelength range 5700–6700 Å.

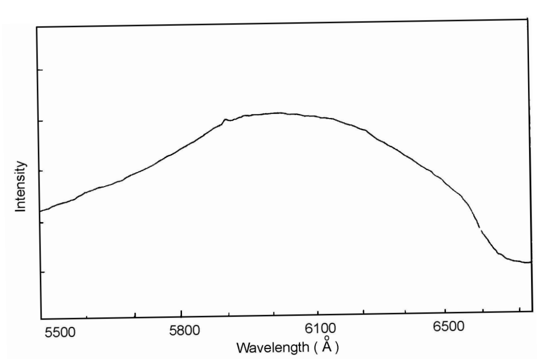

Figure 2. Densitometer tracing of the emission band.

been observed. We may designate the visible emission system in the region 5700–6700 Å as 0.6 μm band. The question naturally arises whether this 0.6 μm band can be observed in interstellar space like the other two emission bands in the middle infrared. The answer to this may be found in the reddening law to some extent. There seems to be a correlation between the 0.6 μm diffuse emission band in the red sector of the spectrum and the reddening law [7]. Any emission band at 0.6 μm in the interstellar space has possibly been missed due to the reddening.

Acknowledgement

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