Creation of Laboratory Spectral Library of Beryl in Sevapure Area, Kadavur Basin, Karur District, Tamilnadu

Varsha Prem, B.Gurugnanam, Girish Gopinath and Sorna Chandra Devadass C

Abstract: ***The study aims to create a laboratory spectral library for the mineral beryl by using the spectroradiometer instrument and the Envi software. The mineral collected from Sevapure area of Kadavur Basin. The laboratory spectra were created and matched with the USGS spectral library. For the study of the spectra an imagery file platform is needed and the ASTER data used as the platform. The laboratory spectra formed between 0.556 to 2.4-micrometre wavelengths. The spectral reflectance curve shows the reflectance values from 0.09 to 0.33 micrometres and the high absorption takes place at 0.80 µm. The USGS spectra show the same value at the wavelength and the reflectance value changes as 0.55. Both shows maximum reflectance at 1.00 and the wavelength at 1.65 µm. The spectral library created has used for further studies.***

Keywords: Spectral Library, Beryl, USGS Spectral library, Spectral resampling.

I. INTRODUCTION

The spectral libraries provide a large amount of standard spectral data and remote sensing image extraction of spectral endmember [1]. The present study, the analysis of the spectral reflectance of mineral beryl has done in the room environment using spectroradiometer, named ASD Fieldspec 4. In this instrument the SWIR component is scanning spectrometer, and the VNIR component is array spectrometer.

The Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER), measure reflected solar radiation in three bands between 0.52 - 0.86 µm in the visible to near-infrared (VNIR) wavelength region, and in six bands from 1.6 µm to 2.43 µm in the short-wave infrared (SWIR) wavelength region and the last five bands comes under 8.12 - 11.65 µm wavelength. The spatial resolution is 15 m for the VNIR bands, and 30 m for the SWIR bands and 90 m for the TIR bands. In the present work ASTER data is used as a platform for correlating the USGS spectra and the field spectra [2] [3] [4].

Beryl comes under Cyclosilicates category. The general properties are pale green colour, white streak, vitreous lustre, conchoidal to uneven fracture [5]. In the Kadavur Basin the mineral was identified from the location named Sevapure which located at 78°12'15.26" E, 10°35'52.64"N. In the mineral was found associated with feldspar.

II. STUDY AREA

The sample beryl was collected from the Sevapure area (Fig. 1). The study area lies around the Kadavur Basin, Karur district of Tamil Nadu. The study area covers the part of Survey of India Toposheet 58J/2 and 58J/6. According to the Geological Survey of India Geological Resource Map, the study area contains Calc-granulites and limestone, Hornblende-Biotite-Gneiss, Kadavur Anorthosite, Pink Migmatite, Quartzite and Ultramafic. Most of the study area covered by Ultramafic, which includes Gabbro, Pyroxenite, Norite [6] [7] [8] [9].

Fig: 1 Sevapure study area, Kadavur Basin; Google Earth Image

III. METHODOLOGY

The samples have collected from the location Sevapure. The megascopic identification of the sample has done, and the laboratory spectra of the sample have taken by using the ASD Fieldspec 4 spectroradiometer. The instrument measure spectral reflectance, spectral absorbance, spectral transmittance, spectral radiance and spectral irradiance [10]. In the spectroradiometer the files are saved in the ASD file format to work with Envi software. For reducing noise, the spectra of the sample taken in the dark background. These used for making the identification of the Spectra of mineral Beryl.

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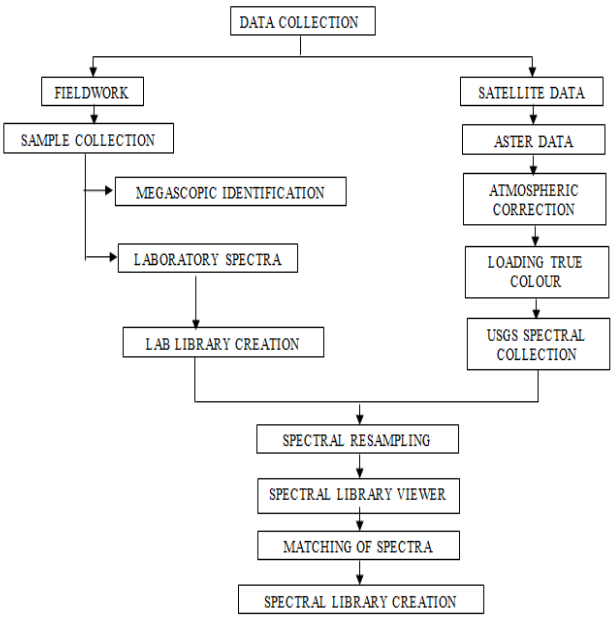
For the identification of the mineral spectra, the lab spectra have to compare with the USGS spectra. For that it has to be compared with the USGS spectral library. Before doing this, both the spectra, i.e. the lab spectra and the USGS spectra has to be resampled. The band intervals between the lab spectra and the USGS spectra are different. For removing these spectral intervals the spectral resampling has done by using the Envi software.

For the comparison of the spectra an imagery file platform needed. The ASTER data s used for this. In the ASTER data, after doing the FLAASH the true colour has loaded and selected the location. It used as a reflectance file. After loading the ASTER data, from the spectral library viewer, the spectra have been selected and can match with the USGS spectral library.

The methodology flow chart is given below



IV. RESULT AND DISCUSSION

The megascopic identification of the mineral done by using its physical properties like pale green colour, white streak, hexagonal crystal form, vitreous lustre and it is opaque (Fig. 3). The lab spectra of beryl were taken, and it has resampled to match with USGS mineral spectral library (Fig. 4 & 5). After resampling, the laboratory spectra has matched with the USGS spectra. After the resampling the spectral analyst result shows the score value, Spectral Angle Mapper (SAM), Spectral Feature Fitting (SFF) and Binary Encoding (BE). These are the identifying weighting methods. The correct spectra show the highest Score value, SAM, SFF and BE (Fig. 6). Here the Score value is 2.280, similarly the SAM, SFF and BE value are 0.808, 0.583 and 0.889 respectively. In Fig. The red colour spectra show the laboratory spectra of beryl and the white spectra shows the USGS spectra of the mineral. The USGC name of the sample is beryl2.spc Beryl HS180.3B and the laboratory spectra have given in the name 22c) beryl. In the laboratory spectra the spectra have been formed between 0.556 to 2.4-micrometer wavelengths. The spectral reflectance curve shows the reflectance values from 0.09 to 0.33 micrometre. Here the high absorption takes place at 0.80 µm. The peak falls at the value 0.209 µm in the wavelength range of 2.1 µm. When the laboratory spectra matched with the USGS spectral library it shows maximum absorption at the point 0.36 at 0.8 µm wavelength. The USGSSpectra show the same value at the wavelength and the reflectance value changes as 0.55. Both the spectra shows themaximum reflectance at 1.00 and the wavelength at 1.65 µm.

Fig: 3 Beryl mineral from field

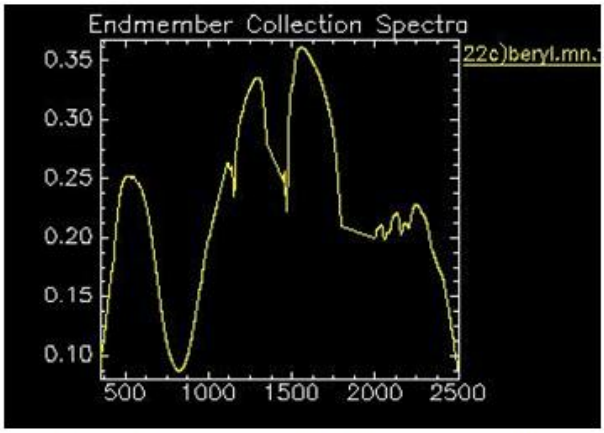


Fig: 4 Lab spectra of Beryl before resampling

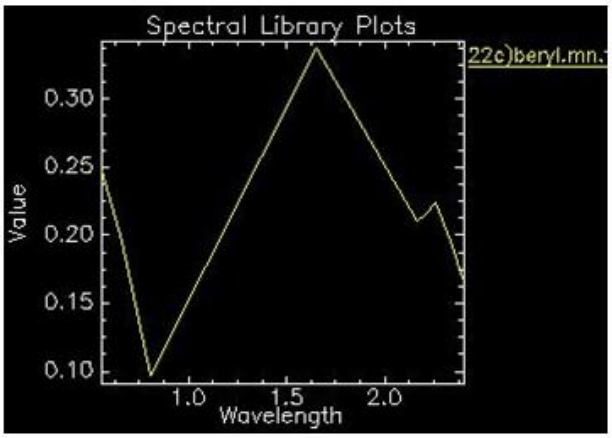


Fig: 5 Lab spectra of Beryl after resampling

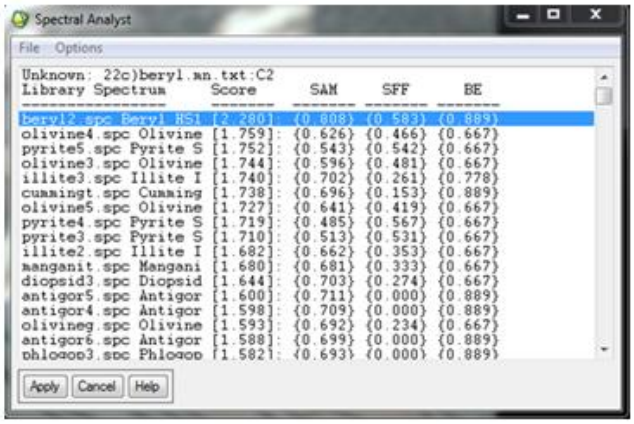


Fig: 6 Total Scour, SAM, SFF and BE of Beryl

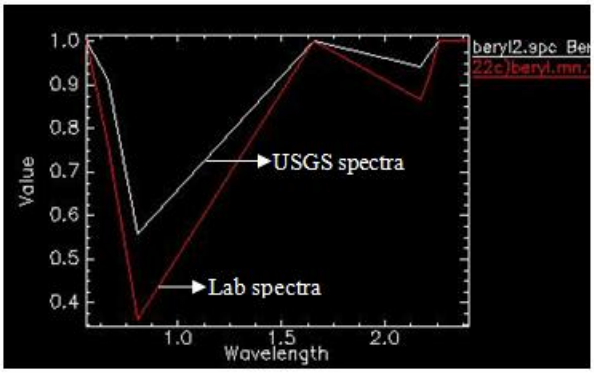


Fig: 7 Lab Spectra and USGS Spectra

V. CONCLUSION

The megascopic identification of the Beryl was done by using the physical properties of colour, streak, crystal form, trancperacy and lustre. The resampled laboratory spectra of the beryl have matched with the USGS spectral library. Using the laboratory-based spectra a set of spectral library can develop for further studies.

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