Spectroscopic estimation of SiO_2 for characterizing clays in the Brahmaputra river sediment

BHASKAR J SAIKIA

Department of Physics, ADP College, Nagaon -782 002, India (vaskar_r@rediffmail.com)

We report here the characterization of sediments from the Brahmaputra river. The samples were collected along the stretch of the Brahmaputra river channel. Analysis of the sediment is presented with the help of FTIR and XRF spectroscopic methods. Clay mineral analyses provide evidence for diagenesis. The maturity index of sediment and extinction coefficient of SiO_2 inclusion reflects the nature of erosion quality of the river.The major constituents of the samples are silica, alumina, which confirms the chemical analysis of clay. The LOI was determined at 800°C. The relatively large difference in the LOI values between 9.87 wt % and 22.21 wt % indicates that greater loss on ignition took place during the calcination step. This is largely due to the giving off of structural hydroxyl water and volatile organic components. The samples showed SiO_2 contents between 34.77 and 56.41 wt%. The grain size of the sediment samples are measured from the SiO_2/Al_2O_3 (wt %) ratio. The maturity index is invalidating with gain size of the samples, which indicate that the maturity increases with the decrease of quartz content and grain size. The correlation of the K_2O, TiO_2, Na_2O and MgO with Al_2O_3 indicate that these compounds of the sediment samples are completely associated with detrital phases of erosion process of the river. The region 400-800 cm^{-1} represents generally the bands assigned to the O-Si-O and O-Al-O bending region. The region 800-2000 cm^{-1} contains the Si-O and Al-O stretching modes and the region 2600-4000 cm^{-1} represents the OH stretching modes. In the O-Si-O and O-Al-O bending region of the infrared spectra of the studied samples are complex and there is a significant overlap between the quartz and kaolinite bands. The deposition of kaolinite in the sediment samples of the different stages of the river track can be differentiated on the basis of its quartz content. Comparison between the maturity index and extinction coefficient of the sediment samples shows a marked increase of SiO_2 content.

Spectroscopic characterization of olivine due to Fe/Mg in Dergaon H5 chondrite

BHASKAR J. SAIKIA[1], G. PARTHASARATHY[2] AND R.R. BORAH[3]

[1]Department of Physics, ADP College, Nagaon -782 002, India (vaskar_r@rediffmail.com)

[2]National Geophysical Research Institute (CSIR), Hyderabad-500 007, India (gpsarathy@ngri.res.in)

[3]Department of Physics, Nowgong College, Nagaon -782 001, India (rashmirekha_b@rediffmail.com)

The effect of the Fe and Mg ratio of olivine group $[(Mg_nFe_{2-n})SiO_4]$ in the Dergaon H5 chondrite has been investigated by Fourier Transform infrared (FTIR) and X-ray florescence (XRF) analysis. The change of peak positions of the SiO_4 tetrahedra in the stretching region have been observed with the Fe, Mg contents. The special interest is given in systematic band shifts in forsterite- fayalite series. The SiO44– tetrahedra are isolated in the structure and linked by cations Fe^{2+} or Mg^{2+} in octahedral positions. The cation positions in the structure can be filled with iron and magnesium in all possible ratios and sometimes it is occupied by Ca^{2+} or Mn^{2+}. The iron and magnesium (Fe/Mg) ratio in olivine is expressed as the forsterite content, and is calculated from the atomic percentage of Fe and Mg in the measurements. The variation of fosterite and fayalite compositions are Fo 66-89 and Fa 10-33 mol % respectively. The plot of Fo and Fa against the corresponds wavenumbers for the bands 1to5 of olivine group of the meteorite sample shows a linear variation for Fo and Fa in a different direction. The factors responsible for the frequency decrease of the absorption bands with an increase in iron may be the effects of replacing an ion of smaller radius (Mg^{2+} of radius 0.66Å) with a larger one (Fe^{2+} of radius 0.74 Å). The infrared bands in the 10mm region of the meteorite sample exhibits good agreement with the XRF results. In the 600 - 400 cm^{-1} region, the pyroxene shows a ‘V’ shape in the infrared spectra. This band shape depends upon the Mg/Fe ratio in the sample.