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CHARACTERIZATION OF INDIAN NATURAL MINERAL ANDALUSITE USING XRD, OPTICAL ABSORPTION, INFRARED, EPR AND NMR SPECTROSCOPIC TECHNIQUES

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ABSTRACT

Andalusite, a variety of aluminosilicate mineral has been investigated through optical absorption and EPR studies. The morphology of the sample shows dense, homogeneous single-crystal structure. Prominent X-ray powder diffraction lines observed at the d-spacing 4.5255, 3.9339, 2.7898, 2.2969 and 1.2834Å confirm the crystalline nature of andalusite. Andalusite shows prominent characteristic infrared absorption bands in the region 1200-900, 900-630 and 600-450 cm^{-1} corresponding to Si-O. The spectrum shows a broad band near 3443 cm^{-1} which is due to H-O-H vibrations of adsorbed water. The optical absorption spectrum attests the presence of Fe^{3+} in the sample. The strong signals at g = 4.45 and at g = 5.17 are interpreted in terms of Fe^{3+} at two different environments. The other EPR signal at g = 2.14 suggest the existence of Fe^{3+} ion clusters. The NIR spectrum shows the presence of hydroxyl ions in the sample. ^{29}Si spectrum with ^{29}Si line at −80.052 ppm assigned to the Q^1 silicate unit. ^{27}Al spectrum with ^{27}Al line at 14.626 p.m. related to fivefold coordinated and octahedral aluminium sites.

KEYWORDS: IR Spectral Analysis, Near Infrared, Optical Absorption, EPR, NMR Spectral Analysis