

## **EPR and Optical absorption spectral studies on sphalerite mineral**

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Sphalerite mineral is an important ore of zinc. A brownish black colored sphalerite sample originated from Zawar Mines, Udaipur, Rajasthan, India is used in the present work. The chemical analysis evident that iron is present in higher concentration than other metal ions. In this study, the authors made an attempt to determine the structure of the mineral, valence state of iron and the site symmetry using XRD, electron paramagnetic resonance (EPR), optical absorption and near-infrared spectroscopic features of sphalerite. XRD analysis of the mineral indicate that it is cubic octahedral system with cell constant  $a = 5.41$  AU. The X-ray density is calculated as  $4.068$  g/cm<sup>3</sup>. While the mineral is forming the average particle grain size is calculated as 98.2 nm. The EPR spectral studies are indicating that iron and manganese are present in the mineral. The  $g = 2.2$  is ascribed to iron and  $g$  and  $A$  value observed in the spectrum 1.999 and 6.0 mT are due to Mn(II) in the mineral. This results indicate that iron and Mn(II) impurity might have entered the lattice by substitution. Further the EPR results confirm the presence of manganese in distorted octahedral environment. Heat treatment has resulted in shifting of manganese impurities, from their current location to their lowest energy minimum configuration. The optical absorption spectrum of mineral sphalerite is due to iron impurity only, which is in a distorted octahedral environment. NIR results are due to the presence of water and sulphate fundamentals.