# THE EFFECT OF MIXED ALKALIS ON EPR AND OPTICAL BANDGAP IN $Fe^{3+}$ IONS DOPED $xLi_2O$-$(30-x)Na_2O$-$70B_2O_3$ GLASSES

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Electron Paramagnetic Resonance (EPR) and optical absorption studies of iron doped mixed alkali borate glasses, $xLi_2O$-$(30-x)Na_2O$-$70B_2O_3$-$0.5Fe_2O_3$ ($5 \leq x \leq 28$) have been investigated as a function of alkali content to look for the 'mixed alkali effect' (MAE) on the spectral properties of the glasses. The EPR spectra of all the investigated samples exhibit resonance signals which are characteristic of the $Fe^{3+}$ ions. The EPR spectrum exhibits an intense resonance signal at $g = 4.20 \pm 0.1$, a moderately intense signal at $g = 2.00 \pm 0.1$ and a shoulder in the region of $g = 7.60 \pm 0.5$. The existence of the resonances at $g = 4.20$ and $g = 7.60$ have been attributed to $Fe^{3+}$ ions in rhombic and axial symmetry sites respectively. The $g = 2.00$ resonance is due $Fe^{3+}$ ions coupled by exchange interactions. The number of spins (N) participating in resonance and its paramagnetic susceptibility ($\chi$) have been evaluated. It is interesting to observe that N and $\chi$ increase with x up to $x = 20$ and thereafter it decrease exhibiting a maximum at $x = 20$ showing the MAE effect. The EPR spectra have also been studied at different temperatures (123- 300 K). The number of spins participating in resonance is measured as a function of temperature and the activation energy is evaluated. It is observed that the temperature dependence of paramagnetic susceptibility ($\chi$) obeys Curie-Weiss law. From ultraviolet absorption edges, the optical bandgap and Urbach energies have been evaluated. It is interesting to observe that the optical band gap energy increases whereas the Urbach energy ($\Delta E$) decreases with x up to $x = 25$ showing the mixed alkali effect.