

# Structural and magnetic properties of sodium vanadate tellurite glasses for magneto-optical device applications

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Tellurite ( $\text{TeO}_2$ ) glasses have comprehensive more concentrating from several researchers owing to their exceptional interesting characteristics such as high thermal stability, large infrared transmission windows (0.35–6 mm), comparatively low phonon energies ( $500\text{--}800\text{ cm}^{-1}$ ), good chemical durability and unusual nonlinear-optical properties, with the ability to dissolve large concentration of optical active ions and high dielectric constant [1-3]. Most of the vanadate glasses exhibit semiconducting nature with the electrical conductivity lying in between  $10^{-1}$  and  $10^{-3}\text{ Scm}^{-1}$ , which is known to be due to electron hopping between  $\text{V}^{4+}$  and  $\text{V}^{5+}$  ions. a large number of studies have also shown that  $\text{Fe}_2\text{O}_3$  can significantly reduce the optical band gap of glass and promote the transition of glass from insulator to semiconductor [4]. Tellurite based glasses with reagent grade chemicals from Thermal Fisher Scientific have been used to fabricate them by melt-quenching technique at  $1150\text{ }^\circ\text{C}$  in air atmosphere for 2 hours in the following composition  $40\text{TeO}_2 + 25\text{V}_2\text{O}_5 + 10\text{Fe}_2\text{O}_3 + 25\text{Na}_2\text{O}$  (TVFN).  $680, 769$  and  $929\text{ cm}^{-1}$  FTIR bands revealed which represents V-O-Te bending vibrations in  $\text{V}_2\text{O}_5$  units, stretching vibrations of Fe-O-Te linkage shown in Fig. 1(a). Electron spin resonance spectrum of TVFN provided a g-factor of 1.98 indicates that the glass possesses free electrons shown in Fig. 1(b). Vibrating sample magnetometry (VSM) is assessed for TVFN which shown magnetic hysteresis with magnetization  $0.19748\text{ emu/g}$ , retentivity  $15.010\text{E-}3\text{ emu/g}$  and coercivity  $620.68\text{ Oe}$  revealed in Fig. 1(c). The magnetic properties of these TVFN glasses suggest that the host can be useful for magneto-optical device applications.

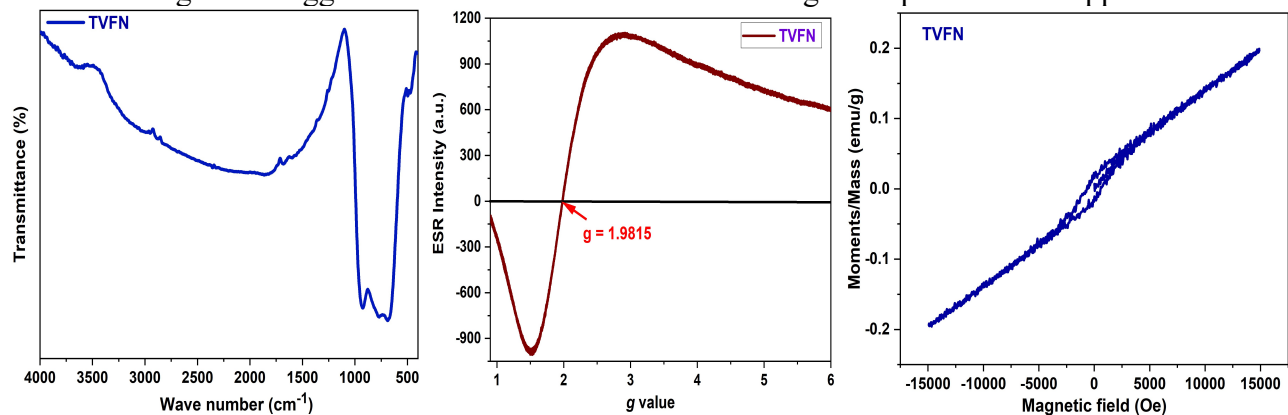


Fig. 1 (a) FTIR spectrum (b) ESR spectrum and (c) M-H curve of TVFN glasses

## References

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