

## Germanate oxide impacts on the optical and gamma radiation shielding properties of TeO<sub>2</sub>-ZnO-Li<sub>2</sub>O glass system

### ABSTRACT

In this work, a series of tellurite glass combined with various concentrations of germanium oxide was fabricated according to the formula of  $(70-x)\text{TeO}_2-x\text{GeO}_2-20\text{ZnO}-10\text{Li}_2\text{O}$  where  $x = 5, 10, 15$  and  $20$  mol% via utilizing the melt-quench method for possible use in a radiation shielding applications. X-ray diffraction and Attenuated Total Reflectance Fourier Transform Infrared was employed to investigate the structure of the synthesized glasses. The density and Poisson's ratio for current samples reduced gradually from  $5.221-5.008 \text{ g.cm}^{-3}$  and  $0.134-0.131$ , respectively, while the enhancement in bandgap values from  $3.700-3.872 \text{ eV}$  with addition of  $\text{GeO}_2$  is observed. The linear attenuation coefficient values at  $0.015 \text{ MeV}$  are  $230.123$  and  $236.832 \text{ cm}^{-1}$  for samples TG1 and TG4, respectively. Moreover, the lowest half-value layer attained via TG1 and raises from  $0.0030$  to  $3.6684 \text{ cm}$  while the highest HVL attained by TG4 and raises from  $0.0029$  to  $3.9696 \text{ cm}$ .

**Keyword:** Tellurite glasses; Germanate; XRDF/TIR; Optical absorption; Radiation shielding