

## Structural, electrical and magnetic properties of $\text{BiFe}_{1-x}\text{Y}_x\text{O}_3$ ( $0 \leq x \leq 0.6$ ) ceramics

### ABSTRACT

The effect of Y substitution on the microstructure, dielectric, magnetic and leakage current properties of  $\text{BiFe}_{1-x}\text{Y}_x\text{O}_3$  ( $0 \leq x \leq 0.6$ ) ceramics was investigated. The  $\text{BiFeO}_3$  phase that is dominant at  $x = 0.0 - 0.2$  decreased with the increase of Y substitution. Other phases such as  $\text{YFeO}_3$  and  $\text{Bi}_{1.46}\text{Y}_{0.54}\text{O}_3$  emerged with Y substitution and became dominant in the range  $x = 0.3 - 0.4$  and  $0.5 - 0.6$ , respectively. The  $\text{BiFe}_{1-x}\text{Y}_x\text{O}_3$  composites of rounded shape grains at  $x = 0.0$  deformed at  $x = 0.1 - 0.3$  and changed to melted-like grains at  $x = 0.4 - 0.6$  with the incorporation of smaller grains at  $x = 0.5$  and  $0.6$ . The sample with  $x = 0.2$  had the highest remnant magnetization ( $M_r = 0.09$  emu/g) and saturation magnetization ( $M_s = 2.9$  emu/g). The sample with  $x = 0.4$  showed the highest dielectric constant of 104 and lowest loss tangent of  $1.34 \times 10^{-4}$ . The leakage current was significantly reduced to a lower value of  $2.80 \times 10^{-8}$  A/cm<sup>2</sup> at  $x = 0.6$ .

**Keyword:** Bismuth ferrite ceramic; X-ray diffraction; Solid-state reaction; Magnetic properties; Dielectric properties