

Comprehensive study on elastic moduli prediction and correlation of glass and glass ceramic derived from waste rice husk

ABSTRACT

Zinc silicate (ZnO–SiO₂) systems were fabricated using zinc oxide (ZnO) and white rice husk ash (WRHA) with compositions of (ZnO)_x(WRHA)_{1-x} ($x = 0.55, 0.60, 0.65,$ and 0.70 wt.%) was symbolized by S1, S2, S3, and S4, respectively. The ZnO–SiO₂ samples were fabricated by applying the melt-quench method and the physical and elastic properties of the samples were investigated. Physical properties used in this study are density and molar volume while the theoretical elastic moduli of the samples produced were obtained using direct calculation of theoretical model compared with the experimental elastic moduli obtained by acquiring ultrasonic velocities using ultrasonic pulse-echo technique. Values of experimental elastic moduli including longitudinal modulus (L), shear modulus (S), Young's modulus (E), bulk modulus (K), and Poisson's ratio (σ) were compared with theoretical model calculated using Rocherulle's model. All the configurations of the elastic moduli obtained experimentally match very well with the configuration from Rocherulle's model but Poisson's ratio obtained experimentally differs from the values of Poisson's ratio obtained through Rocherulle's model.