

## O. A. Ajibade

University of Lagos  
Nigeria

### The Development of Calabash (*Lagenaria siceraria*) Particles Reinforced Epoxy Resin Composite for Thermal Insulation

#### Abstract:

In this study, calabash particles were used as a reinforcement to develop epoxy resin composites for thermal insulation purposes. The calabash particles were ball-milled and divided into two parts. One part of the calabash particle was treated with 10% w/v of NaOH for 24 hours (Alkaline treatment) while the other part of the calabash particle was left untreated and sieved to 150 $\mu$ m particle sizes. The Alkaline treatment was performed to remove impurities from the calabash particles and enhance the interfacial fiber-matrix bonding between the calabash particles and the epoxy resin. The composite was developed using the top-down approach. Different properties of the developed composites were evaluated using tensile, flexural, density, water absorption, thermal conductivity, specific heat capacity, thermal diffusivity tests, and Scanning Electron Microscopy (SEM). The results obtained showed that the 10% NaOH alkaline treatment for 24 hours was sufficient to remove impurities from the calabash particles and enhanced the interfacial-matrix bonding. The treated sample with 5 wt% has the highest tensile strength of 13.055 MPa. The Thermal Conductivity result of the treated sample of 5 wt% composition has a better thermal conductivity of 0.095 W/mK, indicating that the newly developed composite has lower thermal conductivity than epoxy resin. The developed composites exhibited good mechanical and thermal properties, making them ideal for thermal insulation applications in the building industry. The use of sustainable and renewable materials, such as calabash, in building construction can promote sustainable development.

#### Biography

**O.A. Ajibade** has developed research expertise in developing novel composite materials for target applications by utilizing and harnessing the inherent properties abundantly found in natural agro-waste fibres, polymers, and production techniques. He also has a keen interest in carrying out optimization of processes using the Taguchi method and Grey Relational Analysis (GRA) to achieve efficiency and peak product performance. He holds a lecturing position in the Department of Metallurgical and Materials Engineering at the University of Lagos, Nigeria.