

Material selection of a natural fibre reinforced polymer composites using an analytical approach

ABSTRACT

Material selection has become a critical part of design for engineers, due to availability of diverse choice of materials that have similar properties and meet the product design specification. Implementation of statistical analysis alone makes it difficult to identify the ideal composition of the final composite. An integrated approach between statistical model and micromechanical model is desired. In this paper, resultant natural fibre and polymer matrix from previous study is used to estimate the mechanical properties such as density, Young's modulus and tensile strength. Four levels of fibre loading are used to compare the optimum natural fibre reinforced polymer composite (NFRPC). The result from this analytical approach revealed that kenaf/polystyrene (PS) with 40% fibre loading is the ideal composite in automotive component application. It was found that the ideal composite score is 1.156 g/cm³, 24.2 GPa and 413.4 MPa for density, Young's modulus and tensile strength, respectively. A suggestion to increase the properties on Young's modulus are also presented. This work proves that the statistical model is well incorporated with the analytical approach to choose the correct composite to use in automotive application.

Keyword: Material selection; Natural fibre reinforced polymer composites; Rule of mixtures