



Abstract

Optimization of Processing Parameters of Compression Molding Process by Application of Taguchi and Minitab [†]

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A tremendous amount of research is going on to improve the properties of the green composites to compete with conventional composites. Processing parameters play a crucial role in achieving the desired mechanical performance. Henceforth, a study was carried out by using the Taguchi technique to optimize the different processing parameters, such as temperature, pressure, and time to be used in the compression moulding of a green composite using PLA polymer and jute woven fabric as reinforcement. This study focuses on obtaining the best possible combination of processing parameters in order to produce a composite with optimal mechanical performance. An analysis was performed by Minitab software using the Taguchi technique to study the influence of the processing parameters on the mechanical performance of the composite. S/N ratios were calculated using the following equation [1].

$$\frac{S}{N} = -10 \log \left[\frac{1}{n} \sum_{i=1}^n \frac{1}{y_i^2} \right] \quad (1)$$

The composites were prepared by using the combinations of processing parameters obtained from Minitab L9 orthogonal array. The samples were then subjected to tensile tests according to the ASTMD standards. The ranks from response tables indicated that temperature is the most influential parameter, followed by pressure and time and displayed that temperature at level 2, and pressure and time at level 1 were the optimised parameters. The contribution percentages were calculated based on the analysis of variance and found out to be 71%, 26%, and 3% for temperature, pressure, and time, respectively. The analysis from Minitab suggested that the optimized parameters would be 180 °C, 30 bar, and 5 min to obtain the composite with optimal tensile strength. However, this set of parameters is not available in the orthogonal array, so the future steps for this study would be to experimentally validate the results from Minitab.

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