Materials selection of hybrid bio-composites thermoset matrix for automotive bumper beam applicationusing TOPSIS method

ABSTRACT

Materials selection is among the fundamental process involved in automotive product development. Yet, the decision making task is very challenging considering the involvement of multiple conflicting criteria which need to be analyzed simultaneously and selected from list of candidate materials with varying attributes between them, thus multi criteria decision making (MCDM) method is often employed in solving the issue. In this paper, the TOPSIS multi criteria decision making method was applied in the materials selection process of determining the best thermoset matrix for hybrid bio-composites towards the application in automotive bumper beam. Three (3) candidate thermoset materials namely polyester, vinyl ester and epoxy matrics were analysed based on eight (8) performance criteria extracted from the pre-defined product design specification of the bumper beam component. Results from the selection exercise showed that polyester resin is the best thermoset matrix for the hybrid bio-composites construction based on the highest relative closeness to the idea solution score compared to other candidate materials. The use of TOPSIS method was also found able to provide systematic and justified decision making process in gaining the best solution when multi criteria requirement are present and need to be satisfied concurrently.

Keyword: Hybrid biocomposites; Materials selection; Thermoset matrix; TOPSIS method