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Minimization of delamination, surface roughness and thrust force in drilling of Al₂O₃ ceramic particle filled CFRP composites

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Abstract

Present study explores the influence of filler material and drilling parameters on delamination factors, surface roughness and thrust force in the drilling of carbon fiber reinforced epoxy composites (CFRP) using high speed steel (HSS) drill. The CFRP composite was fabricated by hand layup technique and the drilling tests were carried out using L27 orthogonal array (OA) design with wt% of Al₂O₃, spindle speed, point angle and feed rate as input process parameters. Grey Relational Analysis (GRA) is used for multi objective optimization and optimum parameter condition obtained include 4 wt% of Al₂O₃, 3000 rpm speed, 100o point angle and 50 mm/min feed. The optimum set of inputs resulted in 1.1469 and 1.2918 as entry and exit delamination factor values, 1.94 μm surface roughness and 95.29N thrust force. ANOVA is employed to find the influence of process variables on output responses.

Keywords:

Composites, grey relational analysis, ANOVA, drilling, optimization.

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