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FDM process parameter selection by hybrid MCDM approach for flexural and compression strength maximization

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A B S T R A C T

Fused deposition modelling (FDM) is one of the mostly used additive technologies, due to its ability to produce complex parts with good mechanical properties. The selection of FDM process parameters is crucial to achieve good mechanical properties of the manufactured parts. Therefore, in this paper, a hybrid multi-criteria decision-making (MCDM) approach based on Preference Selection Index (PSI) and Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) is proposed for the selection of optimal process parameters in FDM printing of polylactic acid (PLA) parts. Printing temperature, layer thickness and raster angle were considered as input process parameters. In order to prove the effectiveness of the proposed hybrid PSI – TOPSIS method, the obtained results were compared with the results obtained with different MCDM methods. The obtained best option of process parameters was confirmed by other MCDM methods. The optimal combination of process parameters to achieve the maximal flexural strength, maximal flexural modulus and maximal compressive strength is selected using the hybrid PSI-TOPSIS method. The results show that the hybrid PSI-TOPSIS approach could be used for optimisation process parameters for any machining process.

A R T I C L E I N F O

Keywords:
Fused deposition modelling (FDM);
Multi-criteria decision-making (MCDM);
Hybrid PSI-TOPSIS method;
Process parameters;
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