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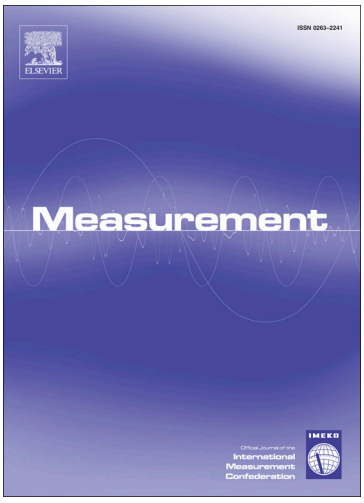

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Investigations of mechanical, thermal and morphological properties of FDM fabricated parts for friction welding applications

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Abstract

Friction welding is one of the solid state welding techniques, for which the two pieces of thermoplastic materials must be compatible to each other. Friction welding of the two similar thermoplastic is an easy exercise but joining two dissimilar thermoplastic is difficult because of large differences in viscosity, specific density, molecular weight, melting point, crystalline vs. amorphous nature, surface behavior and dynamic-mechanical properties. In last three decades, studies have been reported to perform the friction and friction stir welding of thermoplastics but still the reason for compatibility of thermoplastic is not understood properly. In the present study attempts have been made to perform the compatibility analysis of two dissimilar polymers namely; acrylonitrile butadiene styrene (ABS) and polyamide 6 (PA6) by establishing their melt flow properties after Aluminum (Al) metal powder reinforcement. Twin screw extrusion (TSE) and fused deposition modeling (FDM) technologies were used to fabricate the welding specimen for potential application in maintenance engineering.

Keywords: Mechanical, Thermal, Morphological, Fused Deposition Modelling, Twin screw extrusion

1. Introduction

Thermoplastics are characterized by their nature of exhibiting physical, chemical, mechanical, thermal and morphological properties such as; fracture resistive capacity, amorphous vs. crystalline, melting and glass transition temperature, surface behavior, carbon chain length, molecular arrangement, and molecular weight vs. molecular density. Dissimilar thermoplastic material posses non-compatibility issues which hinders to apply it in different application; especially where application of thermoplastic needs to be the compatible by characteristics (e.g.

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