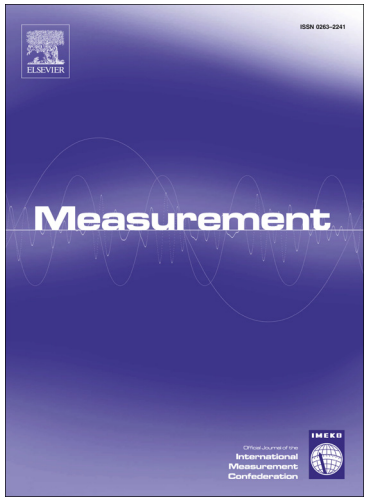

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Experimental and Numerical Procedure for studying strength and heat generation responses of Ultrasonic Welding of Polymer Blends

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Abstract

This paper presents a study undertaken with an objective to establish ultrasonic welding process for joining polymer blends expressed to aid the eco-friendly qualities desired in manufacturing sectors. Polycarbonate (PC) and Acrylonitrile Butadiene Styrene (ABS) blends are welded after creating suitable parts with energy directors using injection molding techniques. It is imperative to estimate the performance of the weld preferred in industrial sectors to be expressed in terms of strength along with the maximum heat generated. Experiments are conducted by varying three of the process parameters namely amplitude, pressure and weld time with measurement of responses such as the tensile strength and heat generated. Artificial neural network (ANN) algorithm is then used to formulate models for each of the measured response. NSGA II is then applied for optimization of models for achieving higher weld strength created with an optimal level of heating. The weld strength of 6.02 N mm^{-2} is achieved with the welding parameters of amplitude (33.14 µm), pressure (4.03 bar) and weld time (3.35 sec). The heat generated at the weld (146.20 ℃) is achieved with the welding parameters of amplitude (40.89 µm), pressure (4.29 bar) and weld time (4.52 sec).

Keywords: Ultrasonic welding; Polymer welding; Weld strength; Heat generation; Artificial Neural network;