Investigations on machining characteristics of metal matrix composites in wire electrical discharge machining

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Abstract:

In this research, an attempt has been made to study the machining characteristics of Al 6061 reinforced with Silicon carbide (SiC) and Boron carbide (B4C) in WEDM. The specimens are fabricated by using stir casting technique. With the help of an optical microscope, the specimens are analyzed to confirm the even dispersion of the reinforcement into the matrix. The hardness value of the specimens is determined by using a Rockwell hardness testing machine. The hardness value increases as the weight percentage of the reinforcement increases. Selection of the machining parameters is a very important process in the machining of MMCs in WEDM. By using Design of Experiment (DoE), the plan of experiment is determined and the experiment is conducted in WEDM. By applying Taguchi analysis, the optimum set of parameters which are used to produce better Material Removal Rate (MRR) and Surface Roughness (Ra) is determined. The analysis of variance (ANOVA) and signal to noise (S/N) ratio have been used to investigate the influence of voltage, pulse on time, pulse off time and current on MRR and Ra.

The effect of addition of reinforcement in the matrix material is investigated by conducting the experiments on Al 6061/3% SiC, Al 6061/3% SiC/3% B4C and Al 6061/7% SiC/3% B4C MMCs. The effect of mixing of Multi Wall Carbon Nano Tube (MWCNT) in the demineralised (DM) water dielectric fluid on MRR and Ra is studied. The wear rate and coefficient of friction between the workpiece without machining, workpiece after machining and workpiece machined using MWCNT mixed DM water has been compared.