

Optimization of micro-EDM parameters for in-situ fabrication of tungsten micro-electrodes using RSM and Genetic Algorithm

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ABSTRACT

This investigation is based on optimization of the process parameters for fabrication of micro-electrodes and their surface integrity using the response surface methodology (RSM). The effects of electrical parameters such as machining voltage and pulse on time, on surface roughness and change in the micro-hardness of the fabricated micro-electrodes were investigated. The RSM is used to establish a regression equation to predict output parameters such as micro-hardness and surface roughness of the fabricated electrodes. From the developed model, the effects of the input variable parameters on the micro-hardness, surface roughness and change in the chemical composition are accomplished with the optimized results. In order to get optimal values of surface roughness and micro-hardness of the fabricated micro-electrodes, a mathematical model was established using RSM, and subsequently Genetic Algorithm (GA) was utilized to reach a set of electrical parameters. From the analysis of variance (ANOVA) result, it can be concluded that the developed models are adequate. The GA method in conjugation with RSM is able to identify a particular set of machining parameters which gives optimal values of surface roughness and micro-hardness. From the confirmation test, it is found that the difference between predicted and measured value is insignificant.

Keywords: Micro-electrode; Surface roughness; Micro-hardness; RSM; GA