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# Experimental Parameters' Effects on the Electrical Discharge Machining Performances

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**Abstract :** The growing market for Microsystems (MST) and Micro-Electromechanical Systems (MEMS) is driving the research for alternative manufacturing techniques to microelectronics-based technologies, which are generally expensive and time-consuming. Hot-embossing and micro-injection modeling of thermoplastics appear to be industrially viable processes. However, both require the use of master models, usually made in hard materials such as steel. These master models cannot be fabricated using standard microelectronics processes. Thus, other micromachining processes are used, such as laser machining or micro-electrical discharge machining (µEDM). In this work, µEDM has been used. The principle of µEDM is based on the use of a thin cylindrical micro-tool that erodes the workpiece surface. The two electrodes are immersed in a dielectric with a distance of a few micrometers (gap). When an electrical voltage is applied between the two electrodes, electrical discharges are generated, which cause material machining. In order to produce master models with high resolution and smooth surfaces, it is necessary to well control the discharge mechanism. However, several problems are encountered, such as a random electrical discharge process, the fluctuation of the discharge energy, the electrodes' polarity inversion, and the wear of the micro-tool. The effect of different parameters, such as the applied voltage, the working capacitor, the micro-tool diameter, and the initial gap, has been studied. This analysis helps to improve the machining performances, such as the workpiece surface condition and the lateral crater's gap.

**Keywords :** craters, electrical discharges, micro-electrical discharge machining, microsystems
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