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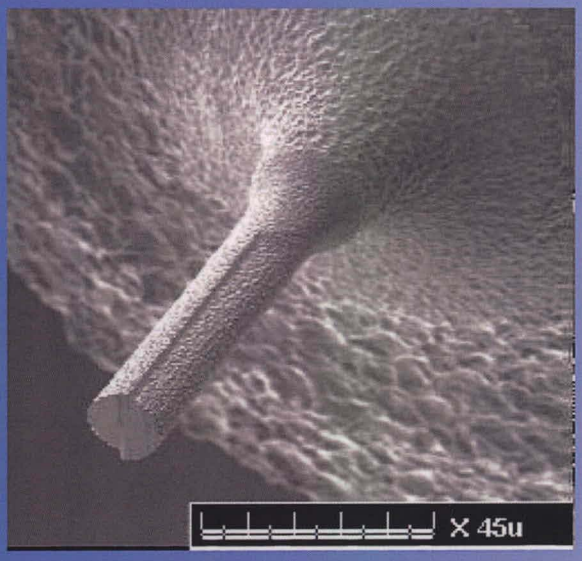

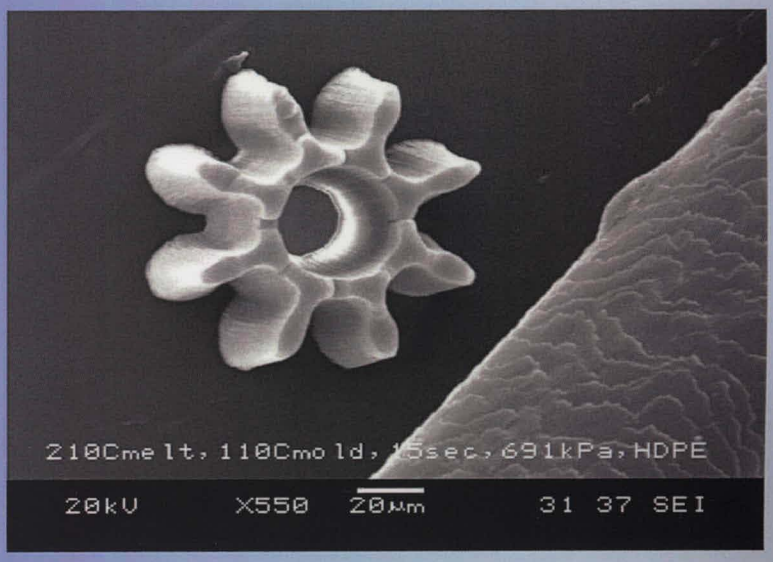

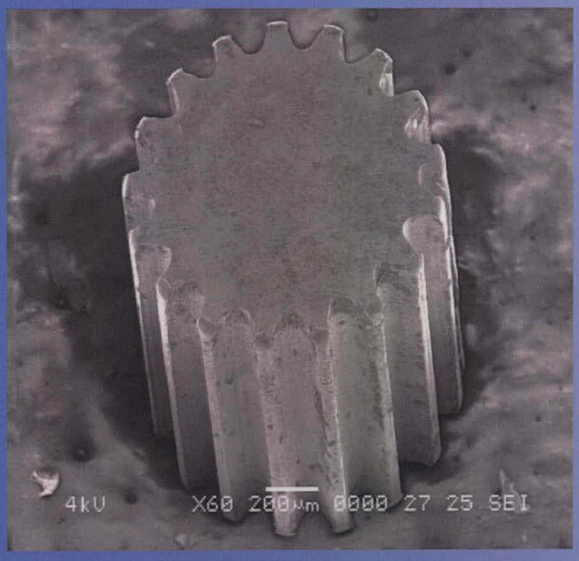

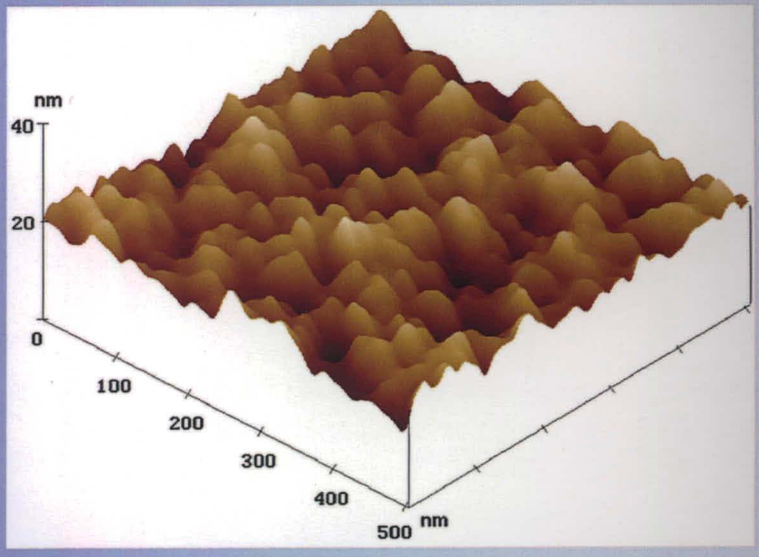

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Chapter 22

Micro Wire Electrical Discharge Machining of Tungsten Carbide: Methodology and Procedure

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Keywords: Micro wire electro discharge machining (MicroWEDM), Tungsten carbide, Design of experiment

Abstract. This project presents the procedure to study micro wire electro discharge machining conditions that give the best response lowest surface roughness and highest material removal rate. The workpiece and electrode materials both are tungsten carbide. The independent parameters such as capacitance, gap voltage and feed rate are considered for exploring their effects on the response variables. Taking all the parameters into consideration, the appropriate experimental methodology was outlines in the Taguchi approach. The Taguchi method is used to formulate the experimental layout, to analyze the effect of each parameter on the machining characteristics, and to predict the optimal choice for each EDM parameter using Design Expert Version 6.0.8. The methods for mathematical modelling have been developed.

Introduction

With the increasing global demand of micro components, the manufacturing technique is moving toward miniaturization. The demand has reduced the physical dimension of electronic and other engineering parts and imposes significant challenge on micro fabrication technologies, such as cost reduction, high productivity, quality, and dimensional accuracy requirement. There are many techniques which can be used for manufacturing micro products such as photolithography, chemical-etching, plating, laser fabrication, mechanical machining, EDM, laser cutting, patterning, drilling, embossing, injection molding, forging, extrusion, stamping, etc.

Electrical discharge machining is one of the nonconventional material removal processes based on the thermoelectric energy created between workpiece and electrode which are submerged in dielectric fluid [1].When the workpiece and an electrode are separated by a specific small gap, electrical pulse discharge occurs which removes material from the workpiece through melting and evaporation. Since the tool is not touching the workpiece, no cutting force is involved in the process [2].This gives EDM an advantage in the manufacture of mould, die, automotive, aerospace and surgical components. Current micro EDM technology used for manufacturing micro features can be categorized into micro wire EDM, die sinking micro EDM, micro EDM milling and micro EDM drilling.