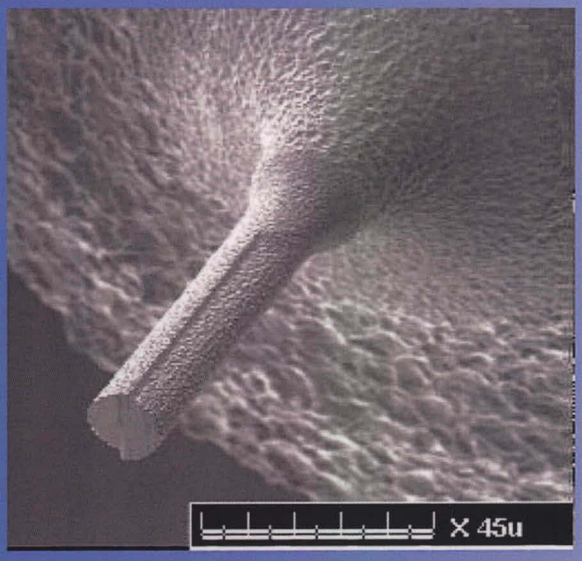
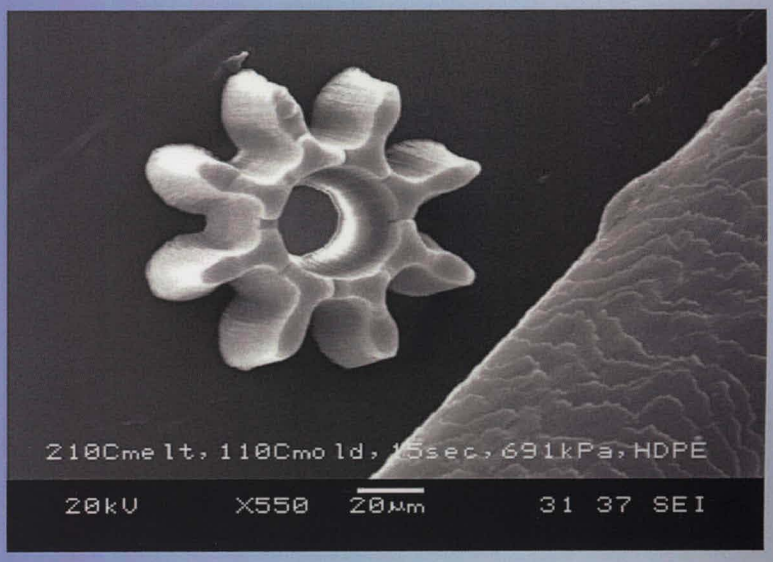
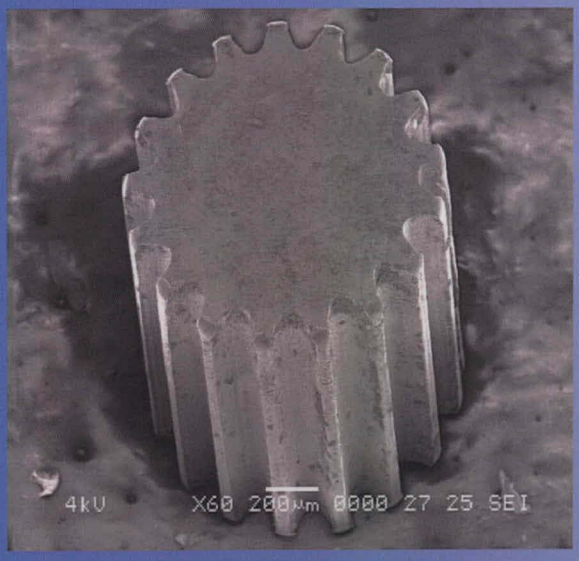
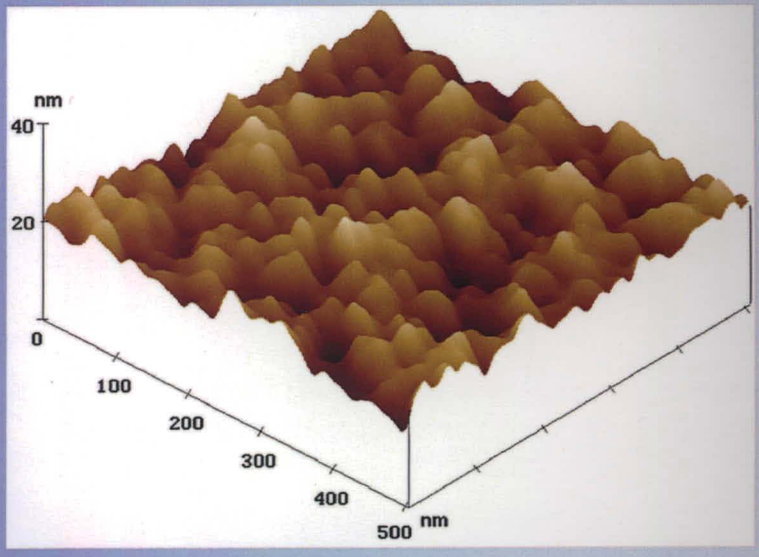
Advanced Machining Process









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Chapter 18

Investigation of TWR for Finish Cut of Titanium Alloy using Micro Electro Discharge Milling

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Keywords: Tool wear rate (TWR), Titanium alloy, Micro EDM

Abstract. This project aims to investigate the finish cut of micro electro discharge milling for nano surface finish in response to Tool Wear Rate (TWR). From the ANOVA and S/N ratio analysis, the statistical models have been developed using L18 (2^1 x 2^3) Orthogonal Arrays design of experiment. The significant process parameters and the possible optimum solution of machining parameters to achieve minimum TWR were also being obtained The optimum solution with combination of all machining parameters for minimum TWR by using Design Expert 7.1.5 is 0.899 or 89.9% desirable to get value of capacitance = 100 nF, gap voltage = 80 V and feed rate = 1 μm/sec, with optimized value TWR = 0.959 μg/min. Optimized machining parameters were used in verification experiments, where the response were found very closed to the predicted values.

Introduction

The process parameters in micro ED milling influence material removal rate (*MRR*), surface quality (SQ) and tool wear rate (*TWR*). The principle of micro ED milling is not directly applicable to micro die-sinking EDM. In micro die-sinking EDM, the occurrence of the high tool wear necessitates the use of multiple tools with increasing dimensions to produce the desired geometry and accuracy [1]. Even though micro ED milling also suffer with high tool wear, but the influence can be reduce by reduction of machining path per line to only few microns [2]. Also, there are other strategies such as Uniform Wear Method, tool path strategy developed to increase high accuracy for micro ED milling [3]. Therefore, micro ED milling is becoming a more economic alternative to die-sinking micro EDM. This research studied the significant process parameters of micro ED milling in response to *TWR*, optimal solutions of process parameters for multiple-response of *TWR* and to achive nano suface finish for applications in MEMS (microelectromecahanical systems) and other micro technology.

Before After

Fig. 1 Electrode shape changes on after machining