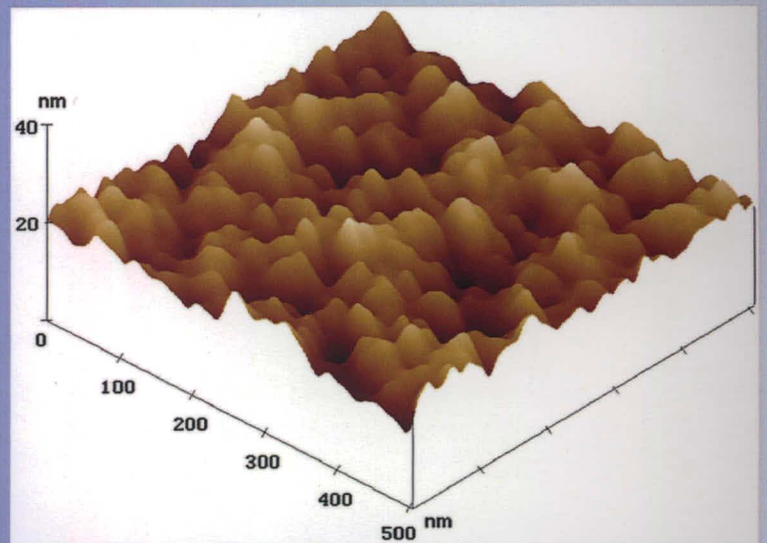
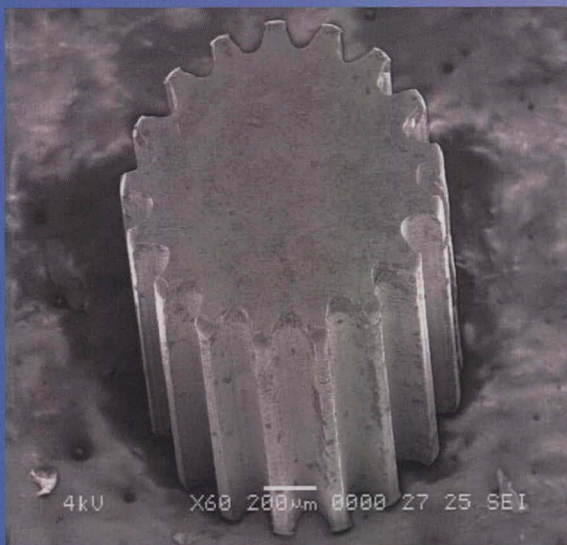
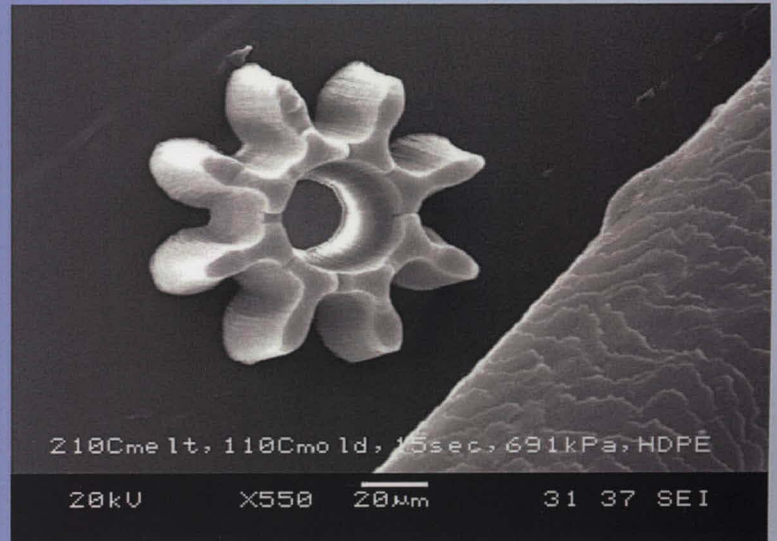
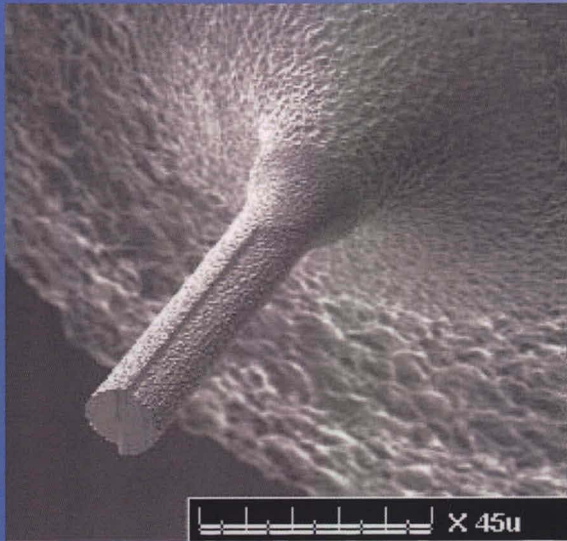


Advanced Machining Process



Editors

Mohammad Yeakub Ali

AKM Nurul Amin

Erry Yulian Triblas Adesta

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Editors

**Mohammad Yeakub Ali
AKM Nurul Amin
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Vibration Issue in Micro End Milling

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Keywords: Micro end milling, Vibration, Dynamic issues in micromilling, PMMA, Microchannel

Abstract. This chapter presents the methodology for experimental investigation and analysis of machine vibration in micro end milling. The main focus is to identify the vibration generation from the machining condition such as spindle speed, feed rate and depth of cut. Tungsten carbide micromilling tool and Integrated Multi-Process Machine Tool DT-110 (Mikrotools Inc., Singapore) is used for machining PMMA (polymethyl methacrylate) workpiece material. Microchannels of 800 μm width were cut with various combination of milling parameters. The vibration amplitude of machine spindle was measured using DYTRAN accelerometer during the experiment. A multi-channel orchestra system is used as an analyzer to analyze the vibration reading detected by the accelerometer.

Introduction

There is a growing need for fast, direct, and mass manufacturing of miniaturized functional products from metals, polymers, composites, and ceramics [1]. Micro/meso mechanical machining (M4) technique is in the range of micro/meso miniature scale. As the scale of devices and components decreases in size, the accuracy of machining method is increasing towards ultra precision.

Micro milling is a direct operation to manufacture small parts offering alternative to other micro manufacturing process. Micro milling also is one of the technologies widely used to microstructure and tooling inserts for microinjection molding and hot embossing [2]. The importance of micro milling grows as the demand for smaller parts within the medical, telecommunications, and aerospace industries increases. However, the cutting parameters create certain level of vibration in micro end milling which finally affects on surface finish and machining. However, the levels of vibration associated with micro end milling parameters such as spindle speed, feed rate and depth of cut not fully studied as it varies case by case. As a result the objectives of this study are:

1. To investigate the relationship between vibration and the micro end milling parameters which are feed rate, cutting depth and spindle speed in micro end milling process
2. To identify the suitable parameters for machining the PMMA Poly (methyl methacrylate) in micro end milling

Literature Review

To accurately analyze a vibration problem it is necessary to describe the vibration in a consistent and reliable manner. Vibration analysts rely primarily on numerical descriptions,