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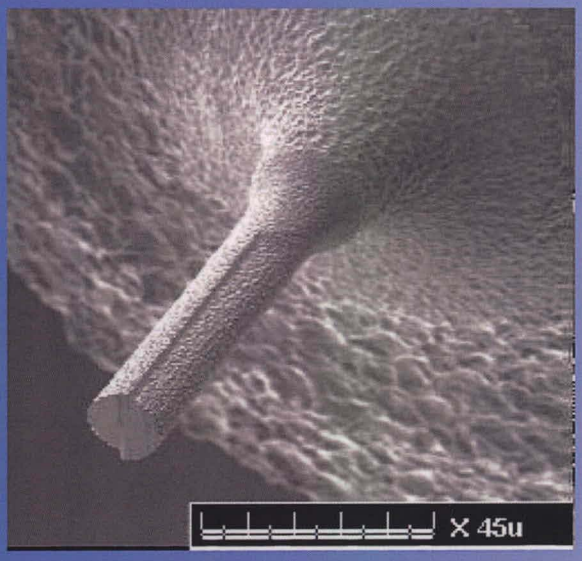

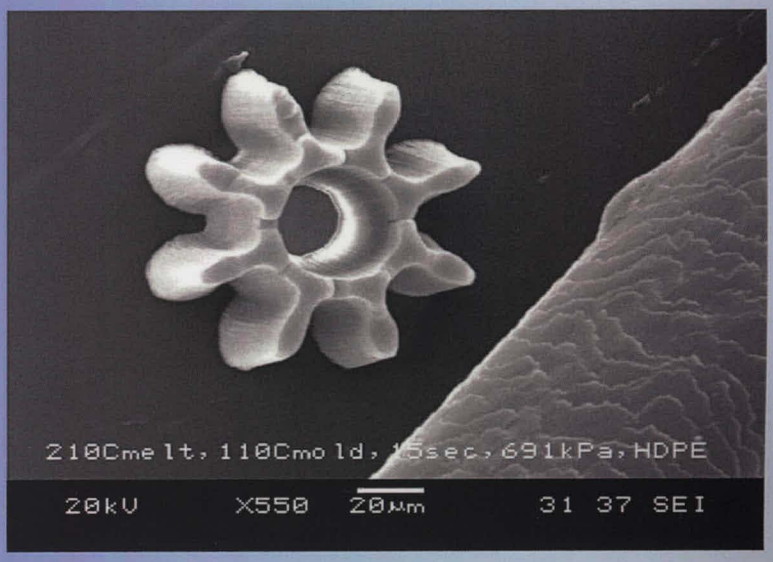

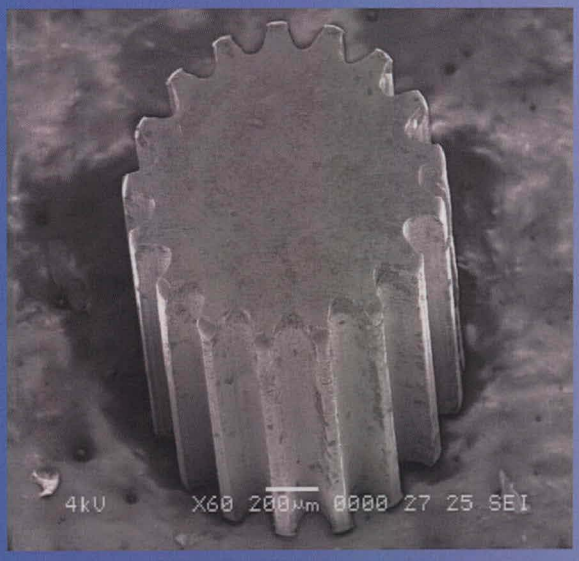

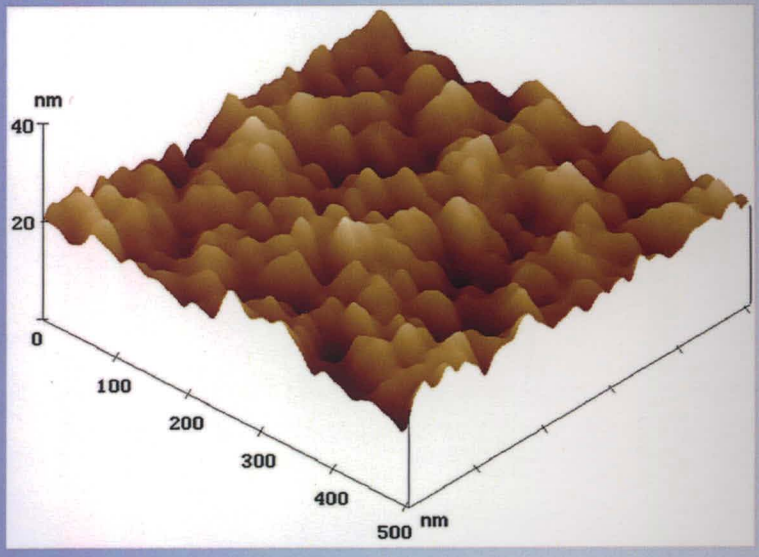

Editors
Mohammad Yeakub Ali
AKM Nurul Amin
Erry Yulian Triblas Adesta

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Tel: +603-6188 1542 / 44 / 45 Fax: +603-6188 1543
EMAIL: iiumprinting@yahoo.com

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Chapter 19

Investigation of Chip Formation and Minimum Chip Thickness in Micro/Meso Milling: Methodology and Design of Experiment

Mohammad Yeakub Ali[a], Siti Hamizah Mass Duki and Noor Adila Mansor
Department of Manufacturing and Materials Engineering
Faculty of Engineering, International Islamic University Malaysia
P.O. Box 10, 50728 Kuala Lumpur, Malaysia
✉: mmyali@iium.edu.my

Keywords: Micromilling, Chip formation, minimum chip thickness, Design of experiment

Abstract. This chapter discusses the methodology and design of experiment for the investigation of chip formation and minimum chip thickness in micro/meso milling for the development of relationship of feed rate, cutting speed and depth of cut with the minimum chip thickness. Literature related to micromilling chip formation and minimum chip thickness is briefly discussed. Experimental procedure is presented for experiment and data collection for modelling the relationship.

Introduction

In the recent years, the production of miniaturized components becomes very important due to increasing demand of microcomponents. Although the sizes are reducing, the performances of the components must be exactly the same or even better from its initial sizes. Micro/meso mechanical manufacturing (M4) can be defined as the production of three-dimensional products that scaled ranging from tens of micrometers to a few millimetres in various types of materials. The major role of M4 is to relate the conventional manufacturing which is macromanufacturing with nanomanufacturing. Nowadays, there are many products that apply M4 in their fabrication such as in automotive, aerospace, biomedical, telecommunications and military industry. Micromilling is one type of direct micromachining processes which means that the structure can be shaped directly and fabricated without molding process. It is also classified as a removing process where it is destroying cohesion among particles to produce desired shape [1]. In addition, micromilling has its own characteristics such as size effect, tool edge radius and minimum chip thickness. The minimum chip thickness has significant impact on the micromilling operation, especially when the uncut chip thickness is closed to micro tool edge radius. So the micromilling process can be divided into two situations which are chip forms and no chip form [2].

Objectives

The objectives of the chapter are as listed below:

1. To study the mechanism of chip formation in micromilling.
2. To study the parameters that affects the formation of minimum chip thickness in micromilling.