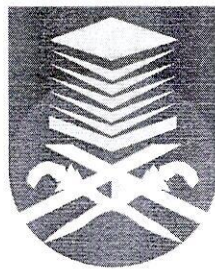


**REVERSE ENGINEERING STUDY OF DIAMOND COATED
ROUTER BIT USING SEM AND EDS METHOD**

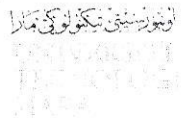


**RESEARCH MANAGEMENT ISNTITUTE
UNIVERSITY TEKNOLOGI MARA
40450 SHAH ALAM
SELANGOR
MALAYSIA**

BY:

**LIEW FUI KIEW
LIEW YIT LIAN
DR. DAYANG MARYANI AWANG HASHIM**

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Tarikh : 20 Mac, 2009 E-Mel:
Surat Kami : 600-RMU/SSP/DANA 5/3 (2/2009)

Liew Fui Kiew
Ketua Projek
Fakulti Sains Gunaan
UiTM Sarawak

Liew Yit Lian
Ahli Projek
Fakulti Sains Gunaan
UiTM Sarawak

Dr. Dayang Maryani Awang Hashim
Ahli Projek
Fakulti Sains Gunaan
UiTM Sarawak

Tuan/ Puan,

TAJUK PROJEK PENYELIDIKAN DANA KECEMERLANGAN KATEGORI C 'REVERSE ENGINEERING STUDY OF DIAMOND COATED ROUTER BIT USING SEM AND EDS METHOD'

Dengan hormatnya perkara di atas adalah dirujuk.

Sukacita dimaklumkan bahawa Jawatankuasa Teknikal RMU Sarawak telah meluluskan cadangan penyelidikan yang telah dikemukakan oleh tuan/puan bertajuk di atas dengan syarat-syarat seperti berikut:

- i. Tempoh projek penyelidikan ini ialah 1 tahun, iaitu bermula 1 April 2009 hingga 31 Mac 2010.
- ii. Kos yang diluluskan ialah sebanyak RM10,000 sahaja. Tuan/puan diminta mengemukakan proposal beserta bajet yang baru mengikut kos yang diluluskan sebelum tuan/puan memulakan projek penyelidikan tuan/puan.
- iii. Pembelian peralatan computer adalah tidak diluluskan.
- iv. Semua pembelian bahan/ peralatan adalah diminta agar tuan/puan mematuhi procedure perbendaharaan di mana pembelian melebihi RM500.00 hendaklah mengemukakan sebutharga dan boring analisa harga.
- v. Pihak tuan/puan dikehendaki mengemukakan laporan prestasi secara ringkas pada bulan June 2009 dan Disember 2009 sepanjang penyelidikan tuan/puan berjalan.
- vi. Tuan/puan perlu menandatangani Borang Perjanjian Penyelidikan dengan kadar segera kerana penggunaan geran hanya dibenarkan setelah perjanjian ditandatangani. Borang Perjanjian Penyelidikan boleh diperolehi di laman web RMI.
- vii. Laporan Akhir perlu dihantar sebaik projek disiapkan dan format menulis laporan akhir boleh diperolehi di laman web RMI.



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ABSTRACT

Router bit is the most critical material during printed circuit board (PCB) depanelization process. Industrial records showed that replacing ordinary router bit with diamond coated router bit can save 80% of the depanelization cost. Hence, the quality and reliability of diamond router bit become a critical issue during material qualifying process. Without diamond coating detail, the quality and reliability of diamond coated router bit cannot be compared in future. A study on the diamond coated structure and the layer of coating of commercial diamond coated router bit is carried out to obtain information on the thickness, layer structures and types of diamond coating. The sample was prepared by etching using Murakami solution and an acid solution of hydrogen peroxide. The sample is analyzed under 5000X magnification of Scanning Electron Microscopy (SEM) to provide details on coating. The SEM results showed that there were two coating layers within the diamond coated layer. The total diamond coated layer was between 11.5-12.0 μm . The energy-dispersive X-ray spectrometry (EDS) provides the detail of material content. The type of coating was plasma-assisted chemical vapor deposition coating which involved pre-deposit layer. The Interlayer diamond coated film confirms has polycrystalline cubic boron nitride (PcBN) structure.

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Router bit is the most critical material during printed circuit board (PCB) depanelization process. According to industrial records, replacing ordinary router bit with diamond coated router bit can save 80% of the depanelization cost (Liew *et. al*, 2008). Hence, the quality and reliability of router bit become a critical issue during material qualifying process. Material qualifying process involves a small scale test at the industry to check on the tool performance. However, there is no initial study done by end users for the specific coating on router bit which is the major contributor for longer life performance. Without this critical information, the quality and reliability of diamond coated router bit cannot be compared in future. Therefore, a study on the diamond coated structure and the layer of coating of commercial diamond coated router bit is carried out to obtain information on the thickness of coating, layer structure and type of diamond coating.

1.2 Diamond

On any measurement scale, diamond is the hardest known material. The mechanical, electrical, thermal, and optical properties of diamond make it attractive for