CARBON FIBER ENCAPSULATION FOR PACKAGING BIO-MEDICAL LAB ON CHIP COMPONENTS

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ABSTRACT

This paper describes a deflection of encapsulation material on Lab-on-Chip (LOC) Biomedical device. The packaging technologies as described in this paper represent important steps in developing a user-friendly, practically usable encapsulation LOC device from a bare biochip. This development aims at a prototype device that can be applied for the evaluation of the biochip's analytical properties and the implementation of suitable assays in the field of medical diagnostic testing. The study involve in determine the best material for outer encapsulation which is required to protect the sensitive element on LOC during high-pressure transfer molded packaging process. The encapsulation material has to have maximum top surface deflection of 100 um under 100 atm vertical loading. The modeling was simulated using CoventorWare ver.2008 software. The material selected for these encapsulation LOC were Polyphenylene Sulfide (PPS) high modulus carbon fiber 55% and Liquid Crystal Polymer (LCP) carbon fiber. From the result it conclude that the PPS high modulus carbon fiber 55% is suitable for encapsulates LOC compared to LCP carbon fiber due to its strength, capable to endure deflection less than 100 um under uniform pressure applied on the top of encapsulation.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

A lab-on-a-chip (LOC) is a device that integrates one or several laboratory functions on a single chip of only millimeters to a few square centimeters in size. LOCs deal with the handling of extremely small fluid volumes down to less than pico liters. Lab-on-a-chip devices are a subset of MEMS devices and often indicated by "Micro Total Analysis Systems" (μTAS) as well. A most major challenge in LOC is to develop standardize packaging while maintaining reliability and functionality of the device [1]. Here, a report on the plastic packaging concept for a silicon biochip fabricated by MEMS (micro electro mechanical system) technology. Instead of plastic packaging, MEMS packaging varies with device function, thus affect the high cost of packaging. Therefore in order to develop the low cost of packaging, device capping followed by glob encapsulation technique in order to reduce the rigorous testing and screening required for low volume parts. [2]

A Biochip MEMS is typical of micro-electromechanical system (MEMS) where biological matter is manipulated to analysis and measurement its activity under any class of engineering and scientific study [3]. The most important applications based in Bio-MEMS are: biological and biomedical analysis and measurements, micro total analysis systems (uTAS). Most of the devices not require interaction with outside ambient devices. Normally, for the electrical connection of silicon dies in MEMS device fabrication, wire bonding and flip-chip technology was used. But there are problem of these technologies where the device potentially have to undergo mechanical, chemical or biological interaction with the environment [3]. This difficulty in finding suitable interconnection and encapsulation solutions is one of the main reasons, why the majority of biochip prototypes, which have been developed