THE IMPLEMENTATION OF LOW COST MINERAL SILICA IN UNDERFILL SYSTEM

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ABSTRACT

In electronics packaging, underfill is needed to improve package reliability in flip-chip devices. The introduction of an underfill which is made up of an epoxy polymer with significant amounts of filler have raises some reliability issues, such as mechanical and thermal reliability. In this study, epoxy filled with various shape of mineral silica fillers are being developed. This present study is divided into two parts; in the first part, the effect of different percentage of filler loadings (e.g : 0%, 15%, 30% and 45% in volume) of various shape of mineral silica powders were studied and optimum percentage of filler loading was chosen. In the second part, the properties of mineral silica and fused silica filled epoxy composites were compared at selected filler loading. The fused silica represents the existing material and the results are used as a control. The scope of this study is to investigate the potential capability of achieving underfill with low CTE values and high flexural properties. In general, it was found that the additions of particulate filler loading increased the elastic modulus and reduce the CTE of the composite. Study shows that the elongated mineral silica particle exhibit good flexural and tensile properties and it shows comparable CTE compared to the other shapes of mineral silica and fused silica filler.

CHAPTER 1

INTRODUCTION

1.1 General Introduction

The development of advanced electronic packages must address the need for miniaturization, low cost and increased performance in emerging electronic products. Flip chip technology is a rapidly growing technique for achieving these needs. The flip chip technology is of interest in high performance packaging technology. It is made of three components which consist of chip, encapsulant (underfill and solder joints/bumps) and substrate. A flip chip package is directly attached to the substrate with solder joints/bumps located between them as shown in Figure 1.1.

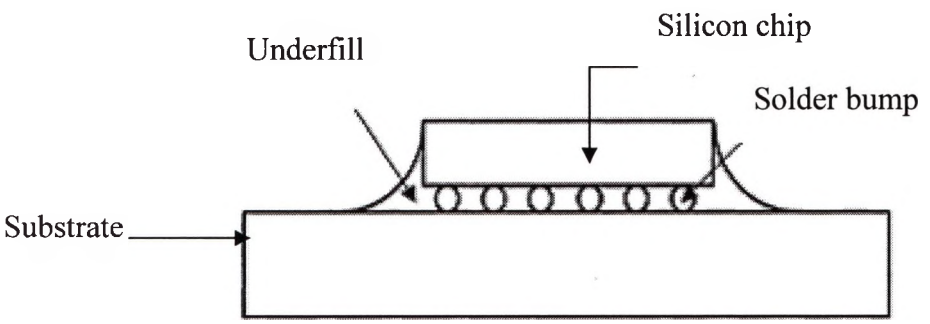

Figure 1.1 : Structure and cross section of flip chip (Wang et al., 1998).

First generation flip chip products use ceramic substrates. These are used in the automotive and computer industries, providing a high degree of reliability due to the close match in thermal expansion properties (CTE) between ceramic substrate and