

# 以紫外光固化膠在 晶圓級低溫封裝之研究

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## 摘要

為了降低微機電封裝成本以及減少製造上的複雜性，以紫外光固化膠結合後處理封裝的概念被導入到微機電的晶圓級密閉封裝上。

紫外光固化膠在接受足夠強度與劑量的紫外光照射後，會產生光化學上的固化反應，接合兩異質表面。這樣的方式完全不必用到任何的加熱程序，十分適合應用在對於溫度敏感的材料或製程上。Pyrex 7740 玻璃首先以溼蝕刻的方式挖出微孔穴來當作保護元件用的上蓋；在旋塗上紫外光固化膠後，玻璃上蓋被拿來對準並接合到元件晶圓上，再經由足夠的紫外光照射以接合兩者。最後，以特殊的切割方式來切割晶片並同時露出接觸墊。兩種測試元件：露點感測器與平行電容板被製造來評估接合的強度與密封性。

在切割後，在電子顯微鏡下沒有發現平行電容板有任何的結構損害或是沾黏的現象產生。此外，被封裝的露點感測器在 190 微米的接合寬度下阻擋 100 度 C 的熱水 150 分鐘後，發現裡面沒有任何的水氣凝結。從加速測試中可以計算得知，這樣的封裝可以在 25 度 C 的水中存活約 3 個星期。

# A Low Temperature Wafer Level Hermetic Package by Using UV Curable Adhesive

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## Abstract

In order to lower the packaging cost and resolve the process complexity of MEMS fabrications, a new wafer-level post-process hermetic package using UV curable adhesive bonding is introduced for MEMS applications.

The UV curable adhesive is cured through UV light exposure without any additional heating, suitable for packaging the devices with temperature sensitive materials or processes. A Pyrex 7740 glass is micromachined and used as a protection cap substrate with microcavities which is spin-coated with the adhesive, aligned, and bonded with a device substrate to form the package after the UV curing. Finally, electrical contact pads expose and die separation are done simultaneously by dicing. Two different monitoring devices, dew point sensor and overlapping parallel capacitor are built to evaluate the package strength and hermeticity.

After dicing operation, no structure damage or stiction phenomenon is found in the packaged overlapping parallel capacitor. Furthermore, no moisture condensation is observed in the package with 190 $\mu$ m bonding width after 150 minutes boil water immersion. The acceleration test results indicate the package can survive about 3 weeks at 25°C, 100% R.H. (Relative Humidity) working environment.

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