半導體鋁銅製程金屬導線缺陷改善及晶圓邊緣良率提升研究

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摘　　要

在半導體業界紛紛由鋁銅製程轉換到銅製程的同時,一個事實或許被忽視了，那就是 — 鋁銅製程相對於銅製程，其實到目前為止，仍占最高比例，故在鋁銅製程性能提升與相關製造成本控制這方面的需求，仍在持續地增加中。

半導體業鋁銅製程金屬內連線均是使用濺鍍沈積法(Sputter deposition) 來沈積鋁銅合金。濺鍍較蒸鍍的優點為濺鍍膜和晶圓表面黏著性較佳、導線電阻值較低，可濺鍍鋁銅合金等優點。其缺點是濺鍍反應室固定晶圓夾鉗模組會使鋁銅合金鍍膜於晶圓邊緣處造成鋁銅合金鍍膜偏薄 ，而造成小 Dice 產品良率下降。

在本研究過程中 ， 我們已成功的藉由修改濺鍍鋁銅薄膜反應室夾鉗模組的設計及製程的改進，使濺鍍鋁銅的範圍 可由原來的距晶圓邊緣 3mm 無法濺鍍範圍降低為 1mm。由於鋁銅薄膜濺鍍覆蓋的面積增加，可使小 Dice 的產品，位於晶圓邊緣的良率增加 。另外在金屬導線缺陷部份，藉由製程的改善也可有效的減少缺陷數目，增加產品良率。

A Study on Semiconductor Al-Cu Process Defect and Wafer Edge Yield improvement

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Abstract

When the semi-conductor industry began changing the chip manufacturing process from aluminum to copper; it is often overlooked that the aluminum process is still more widely used. Therefore the process and performance improvement for aluminum is still on going .Despite the increased use of copper, the aluminum process cost control is still becoming more and more important.

The semi-conductor industry is using the sputter process to deposit Aluminum-copper film. The Sputter process gets better step coverage and better adhesion than the evaporation process. The disadvantage for sputter process is the chamber clamp that will bring the aluminum-copper film thickness trend down, and cause the small dice product to get a lower yield at the wafer edge.

In this study, we successfully in designing a new clamp that can deposit aluminum-copper film distance, from a 3mm improvement to 1mm at the wafer edge. Due to the aluminum-copper film being larger than before the small dice product can get a higher yield at the wafer edge. By sputter process improvement, we also reduced some aluminum-copper film defects, and got a higher product yield.