Wafer UV Resist Hardening System

MACTECH 韶陽科技

晶圓紫外線光阻
硬化系統

韶陽科技股份有限公司
特用光源部

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1.概要

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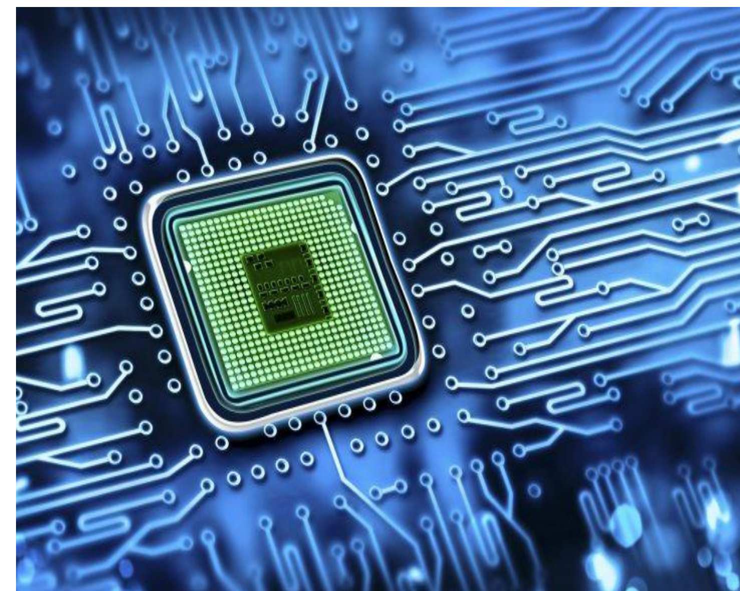
紫外線光阻劑硬化設備

<MUV-WAUV08-LJR01>

UV photoresist Hardening (Curing) System <MUV-WAUV08-LJR01>



此設備主要用於超大型積體電路(VLSI)生產線

This uv photoresist curing system employed in VLSI fabrication lines as UV irradiation equipment

•使用目的

傳統製程(硬烤)在蝕刻時，此過程造成光阻劑圖形的損壞及碳化引起脫離困難的異常狀況，採用UV固化+硬烤時則可避免此異常發生

Processes where resists, used as-is, are prone to surface reactions with plasma during etching or reactions due to ion collisions in the plasma that increase the temperature, causing the resist to flow and damaging the pattern. Also, processes where resists are susceptible to carbonization, and where curing can prevent the resist from becoming difficult to remove

2.主要製程用途

1.離子注入過程中的脫氣和烘烤

1.Resist outgassing and baking during ion implantation

2.乾蝕刻時耐等離子性提高

2.Improved plasma damage resistance when dry etching

3.消除電荷，應力消除

3.Charge neutralization, stress removal

其他

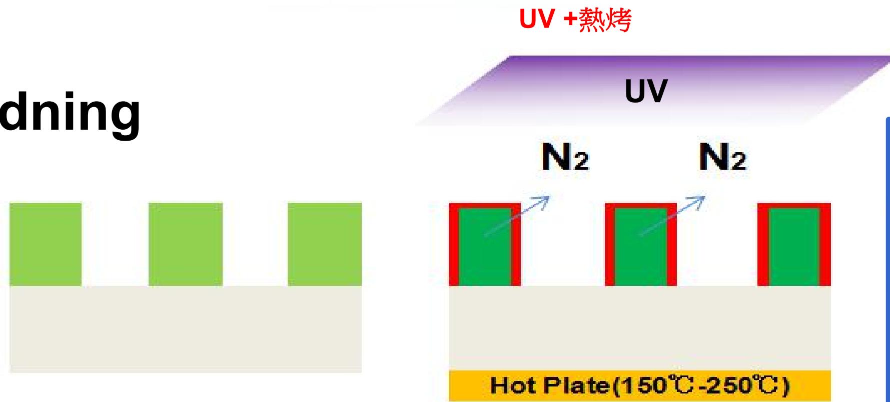
other applications

製程示意

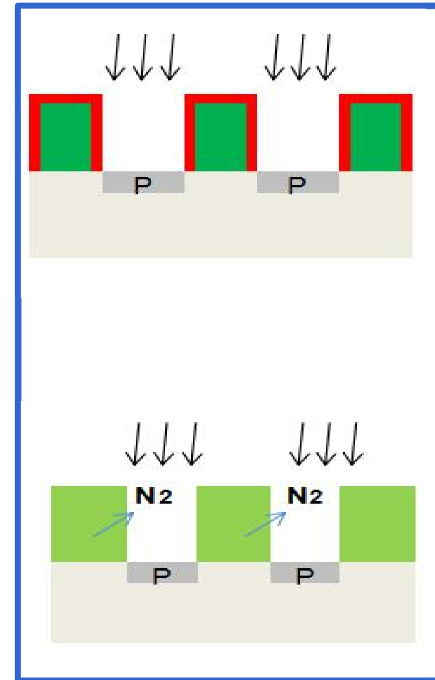
2-1離子注入過程中的脫氣和烘烤

Resist outgassing and baking during ion implantation

UV hardning

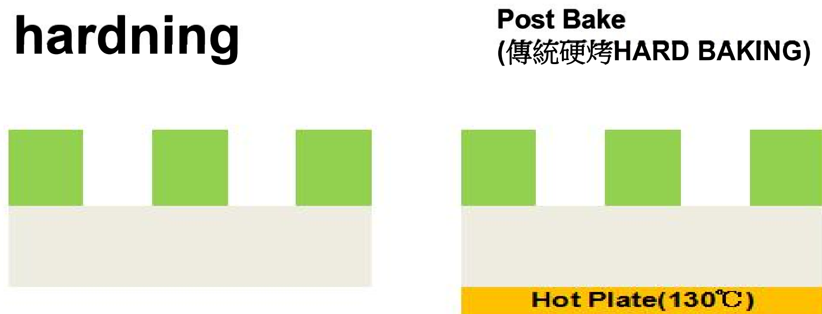


Ion implantation



UV Hardning prevents Impurities entering

NO UV hardning



Resist Impurities entering

process flow

製程示意

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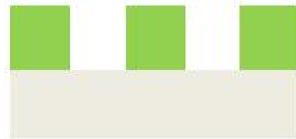
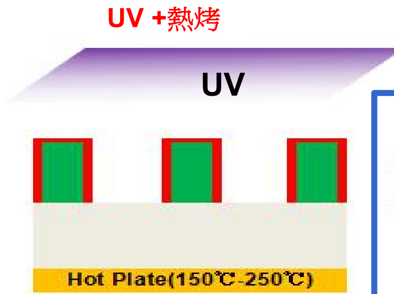
2-2乾蝕刻時耐等離子性提高

Improved plasma damage resistance when dry etching

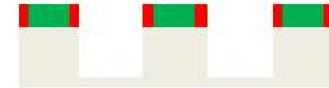
UV hardning





Dry Etching

1.maintaining good profile
2.Dry Etching fast



NO UV hardning

Post Bake
(傳統硬烤HARD BAKING)

Dry Etching slow

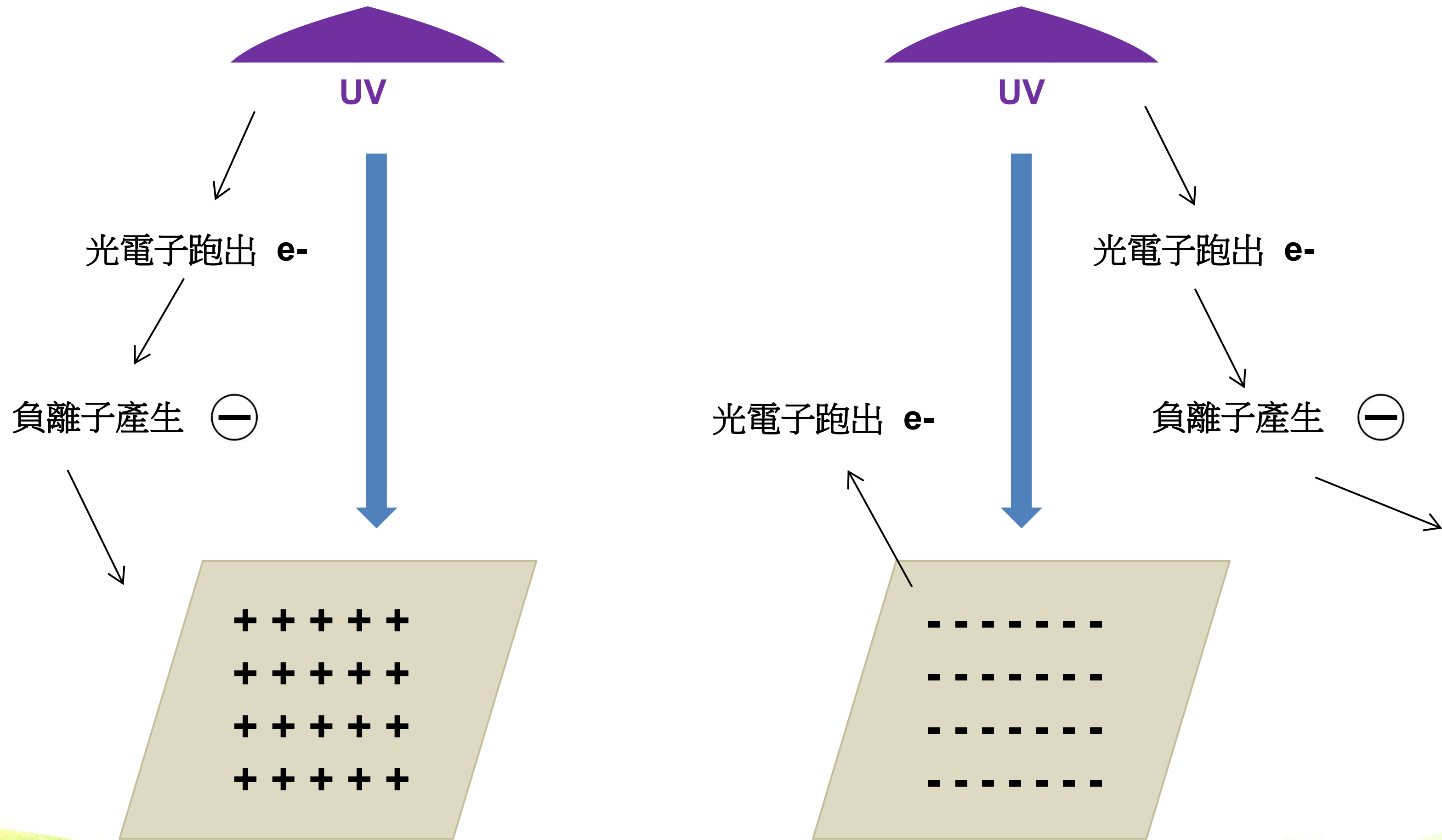
Dry Etching
can't maintaining good profile

process flow

製程示意

2-3消除電荷，應力消除

Charge neutralization, stress removal



3.UV熱固原理

半導體製程中，用在I-line和G-line的正性光阻劑主要成分為酚醛樹脂與感光物重氮萘(Diazo-naphtho-quinon; DNQ)。

正性光阻劑照射UV後，透過DNQ分子結構與酚醛樹脂分子量、化學鍵結結構發生重合反應，提高了抗蝕刻性、熱安定性。

In the semiconductor fabrication process,the maincomponents of the positive resists used for i-line and g-line exposure,are Novolac Resin and Diazo-naphtho-quinon; DNQ.

When a novolac resist is exposed to UV light, a polymerization (chain building) reaction occurs which makes the material chemically and physically stronger, increasing its heat resistance and etching resistance.

光阻劑耐熱溫度 **110～130℃**

Resist heat resistance temperature range: 110 to 130℃

(UV+熱烤)後的光阻劑耐熱溫度 250℃

Resist heat resistance temperature after hardening: 250 ℃

4.製程

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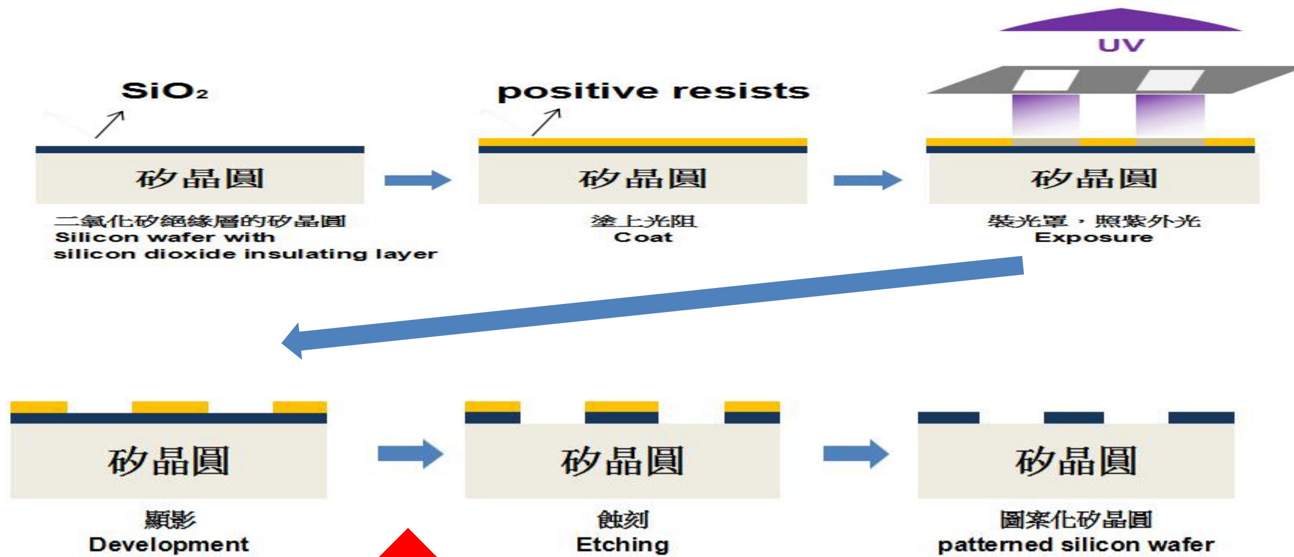
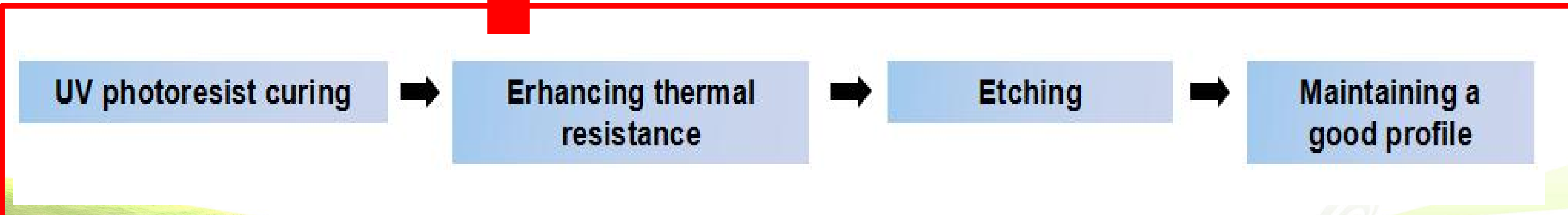
蝕刻或離子注入製程前，以UV照射光阻劑，使其硬化(固化)

此步驟**可提高光阻劑的耐熱性和耐等離子性，可維持光阻劑的良好形狀**

The resist is exposed to UV light before the etching and ion implantation processes, curing the resist. As a result, the heat resistance and plasma damage resistance is greatly improved, preserving the shape of the resist pattern.





4.製程實例

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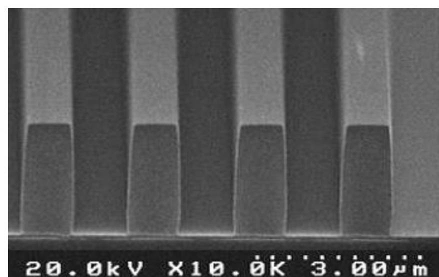
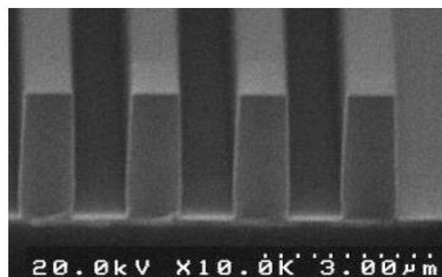
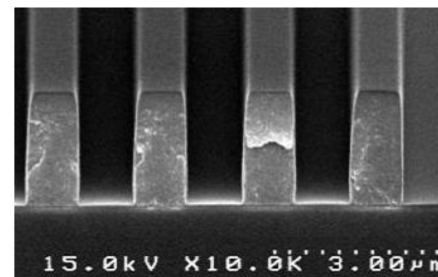
例一



未過UV熱處理

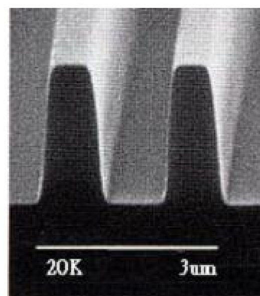


過UV+熱處理後



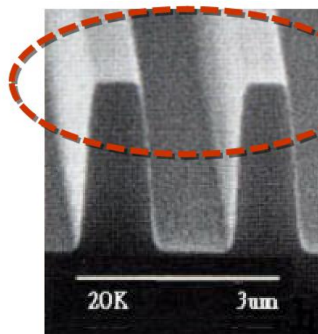
以250度C ,3MIN熱烤測試能維持良好形狀

例二

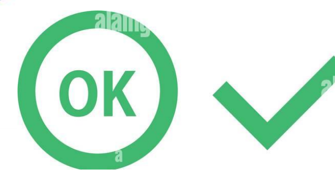


UV熱處理前

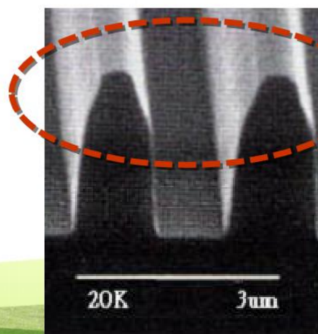
過UV+熱處理



能維持良好形狀



無UV直接熱處理



形狀不良塌陷

4.單片處理時序範例

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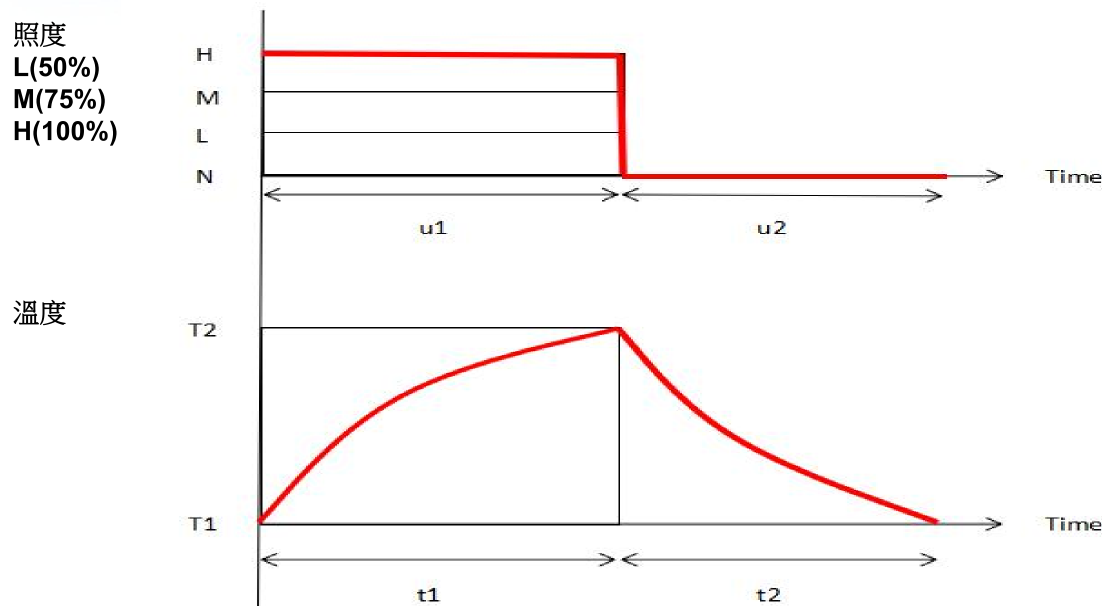


經調台廠客戶資料 UV 每段時間約3 min ,以1次(道)UV照射製程為例
計算1片晶圓所需總時間
取片 傳片,交握放片(0.5min)->1段UV(1min)->冷卻(1min) ->傳片 回晶圓盒(0.5 min)小計約3 min

note.不同光阻型號 所需UV 道數不同,若以1道UV製程為計算 ,
1片 晶圓所需總時間約3 MIN

5.設備

5-1設備特色

1.高效能UV lamp(6.4KW x 3pcs)

High productivity by High Intensity UV lamp

2.燈箱內部模組方便更換

Lamp mount in module and easy replacement

3.PC BASE人機介面操作簡單

User friendly operation

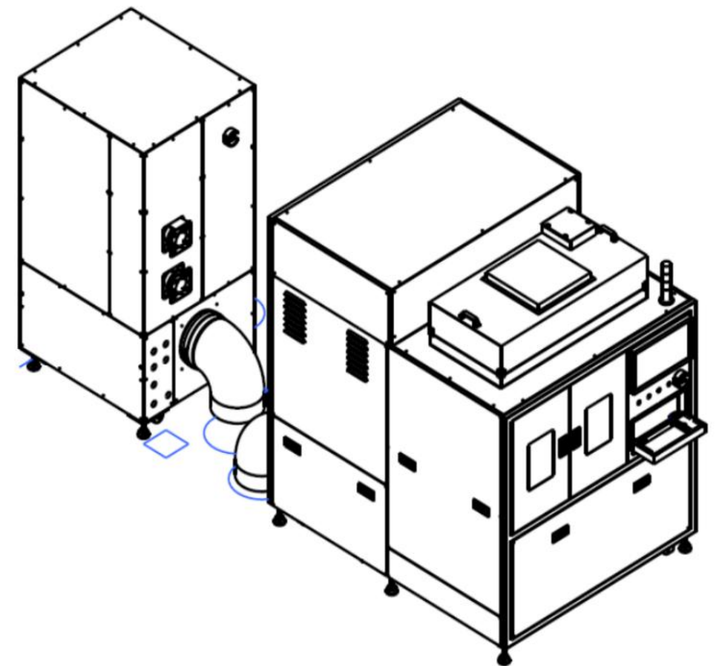
4.自動照度偵測設計，可監控燈照度

Possible to control intensity decreasing by build in intensity monitor. Periodic measurement at the center of stage

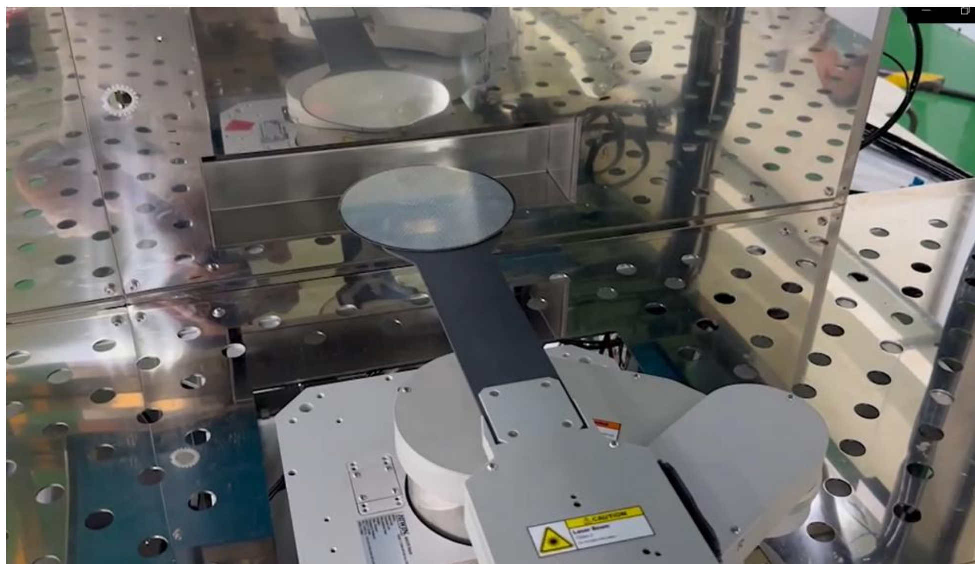
5.設備規格

5-2設備規格

設備類型	MUV-WAUV08-LJR01
晶圓尺寸	6/8/12inch
照射直徑	φ300mm
照射強度	650 mW/cm2以上 （波長365nm）
照射分布	±15%（H模式，5點測量）
照射模式	High(H)/Middle(M)/ Low(L)/N四種模式
加熱盤 升溫速率	△T/△t > 2.0℃/sec （△T≧150℃時，H模式時）
加熱盤 最高溫度	250℃
加熱盤 溫度分布	±3%(6%)以内
加熱盤 設定段數	5段
晶圓傳輸	robot (單fork)
主機尺寸	寬深高 1200X1700X2200(mm)



6.實機動作照片參考



谢谢大家！