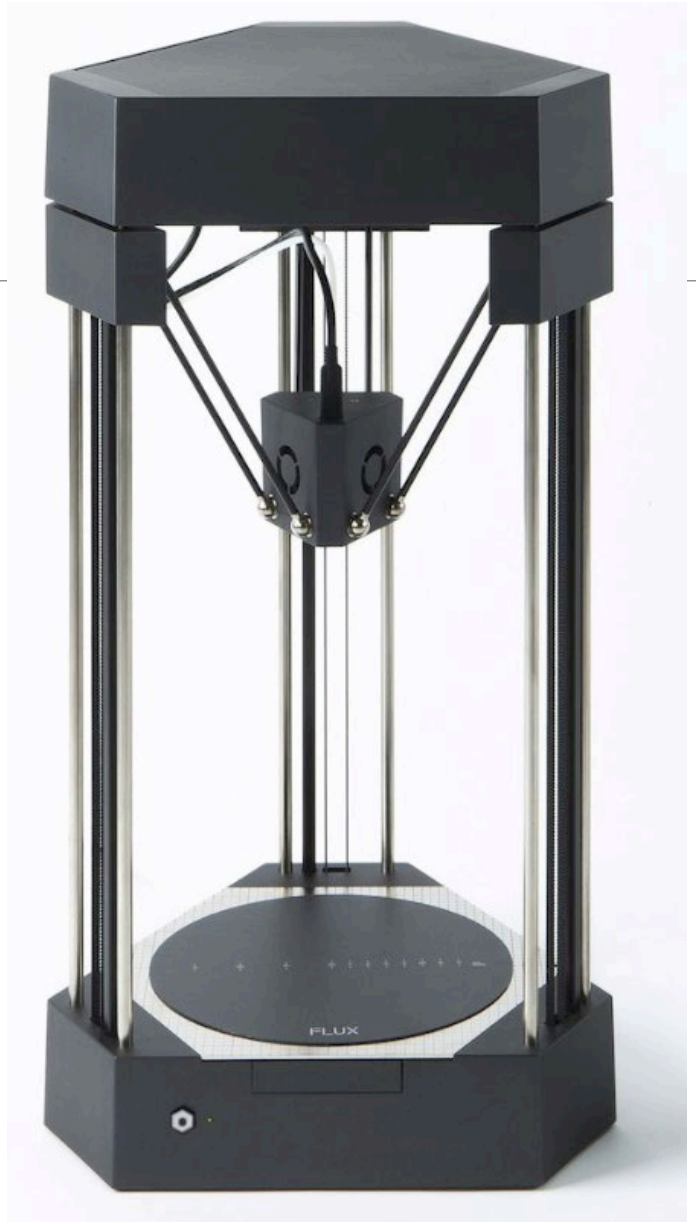
以3D列印填充物及其在CO_2吸收塔效率之研究

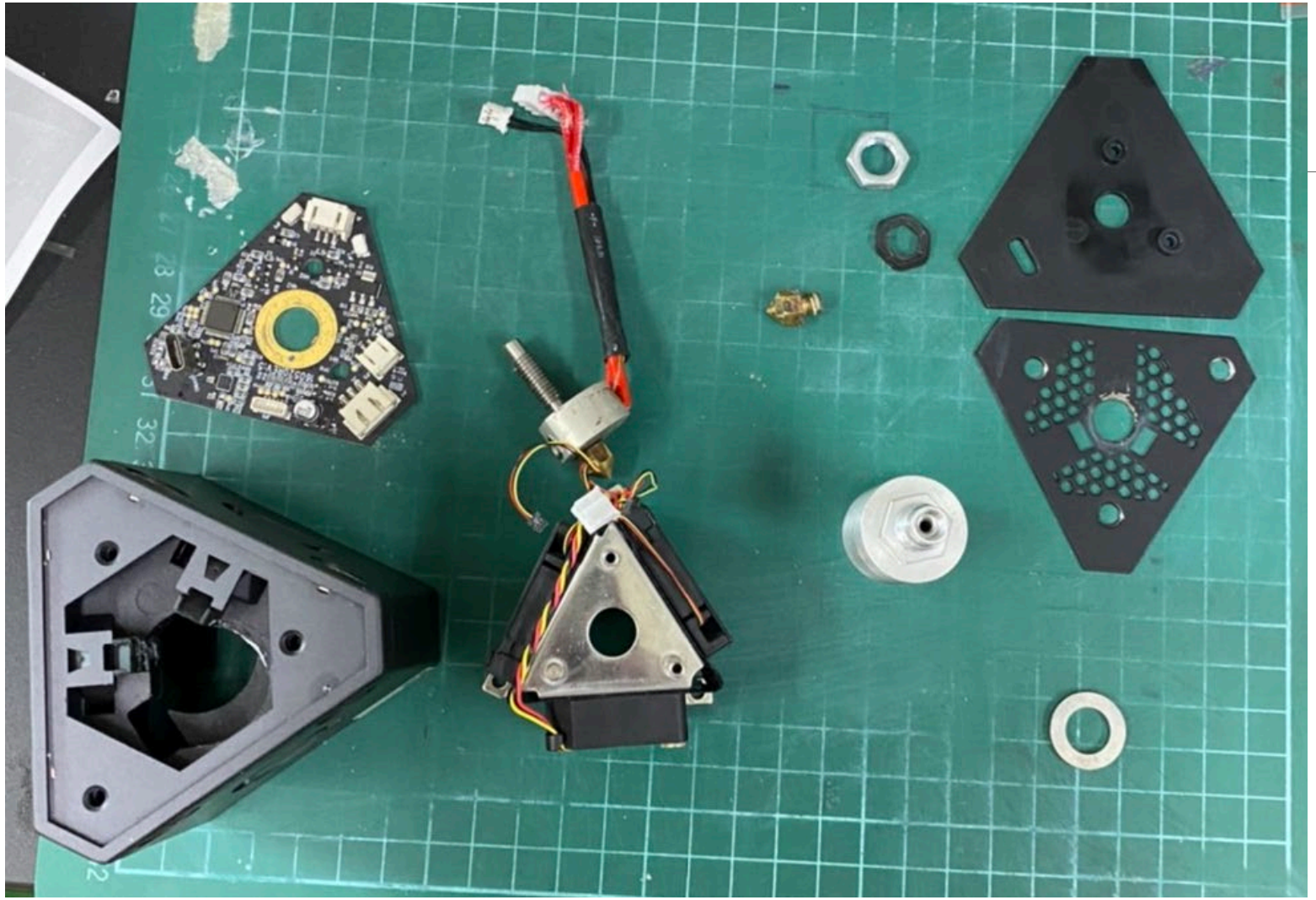
余冠賢、陳證勛、梁誌軒、鄭軒國/王振乾 教授

報告日期:111年7月13日



3DR P Printer

列印填充物

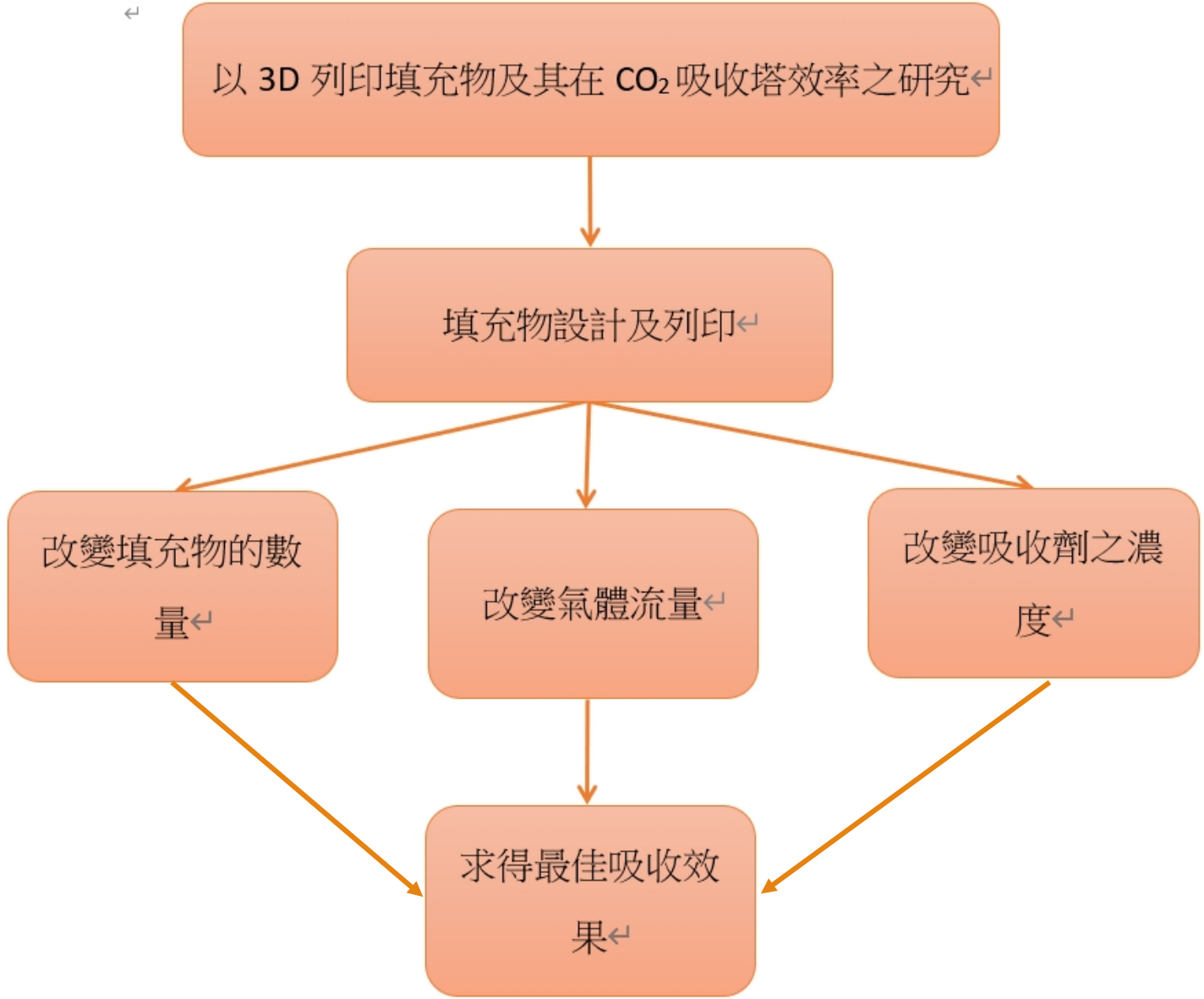


3D列印機
工具頭拆解

PLA

- 耗材便宜維護簡單
- 材質不黏手
- 列印PLA無毒氣
- 可用溶劑粘接

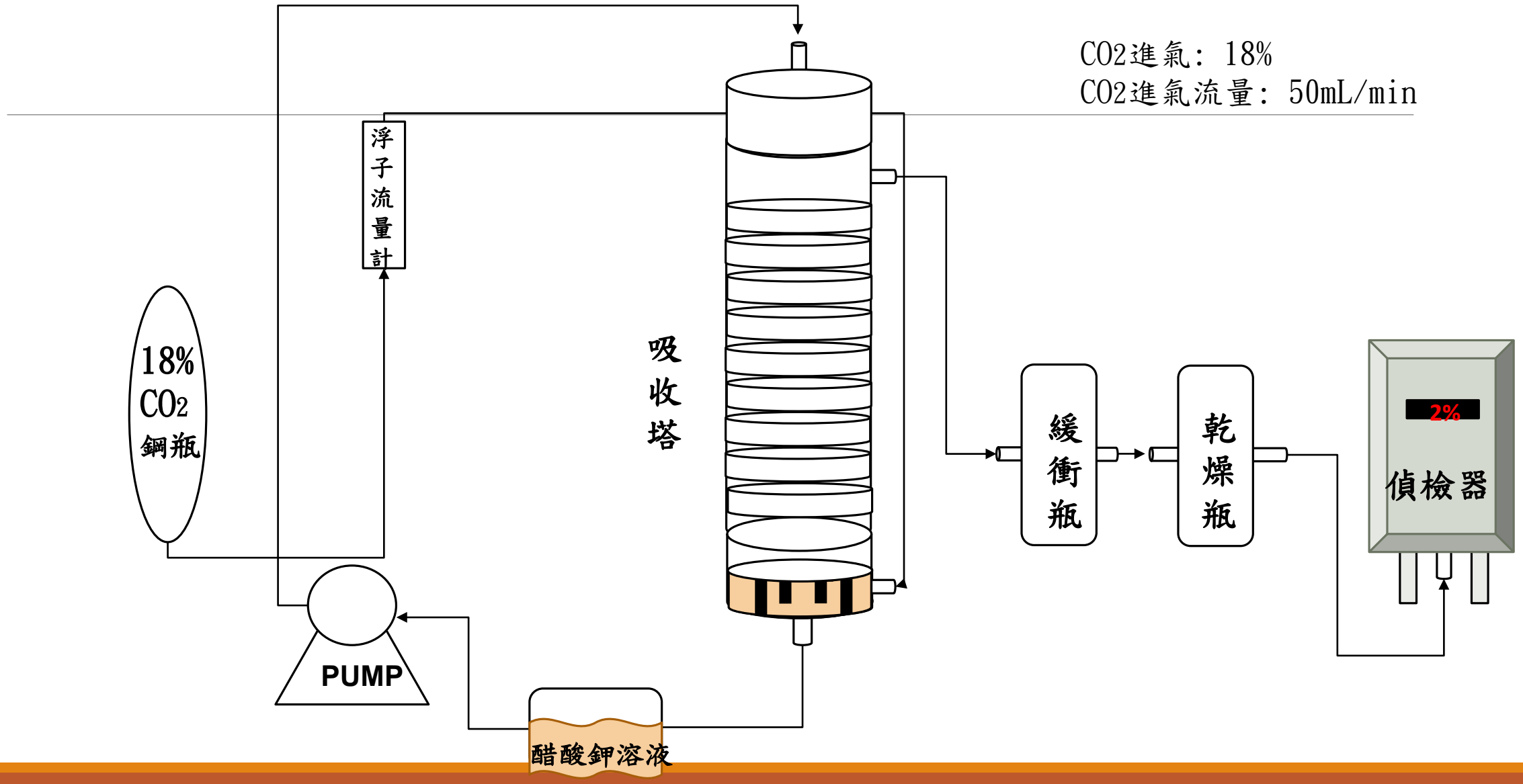
實驗架構


以 3D 列印填充物及其在 CO_2 吸收塔效率之研究
填充物設計及列印
改變填充物的數量
改變氣體流量
改變吸收劑之濃度
求得最佳吸收效果

CO_2使用之濃度

一般工廠排放的CO_2含量落在15~20%
以相同濃度的CO_2來做為實驗基準。

吸收塔示意圖

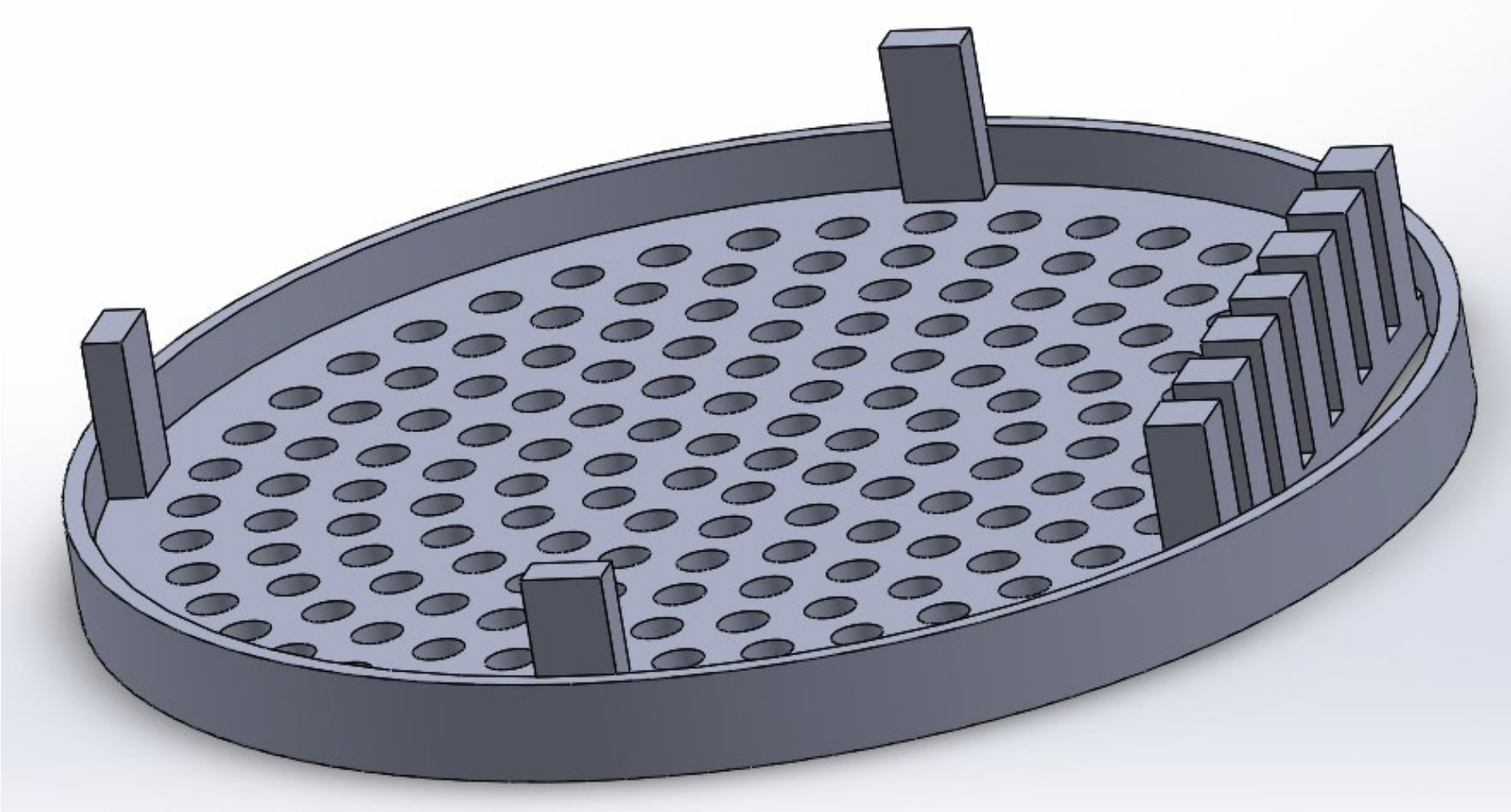

CO2進氣：18%
CO2進氣流量：50mL/min
浮子流量計
18% CO2 鋼瓶
吸收塔
緩衝瓶
乾燥瓶
2%
偵檢器
PUMP
醋酸鉀溶液

實驗數據及成果

吸收效率的計算方式

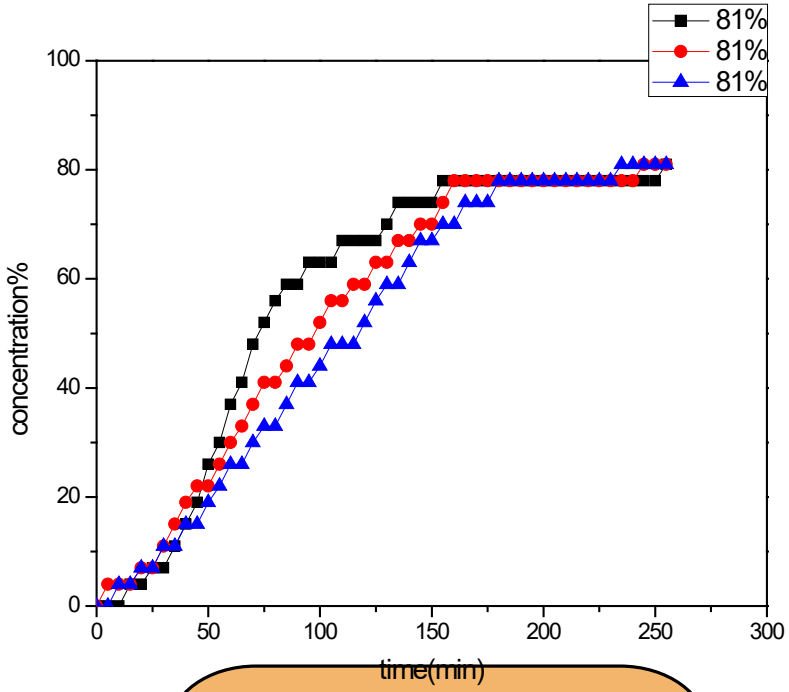
(初始CO_2濃度-吸收後濃度)/初始CO_2濃度

填充物



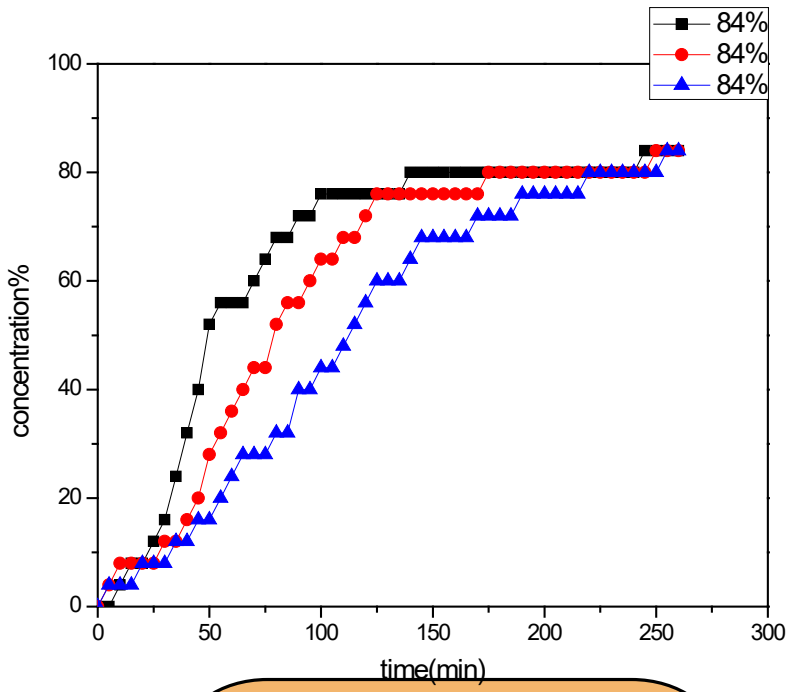
填充物一
總表面積
103.97mm^2

各表面積的吸收效果作圖



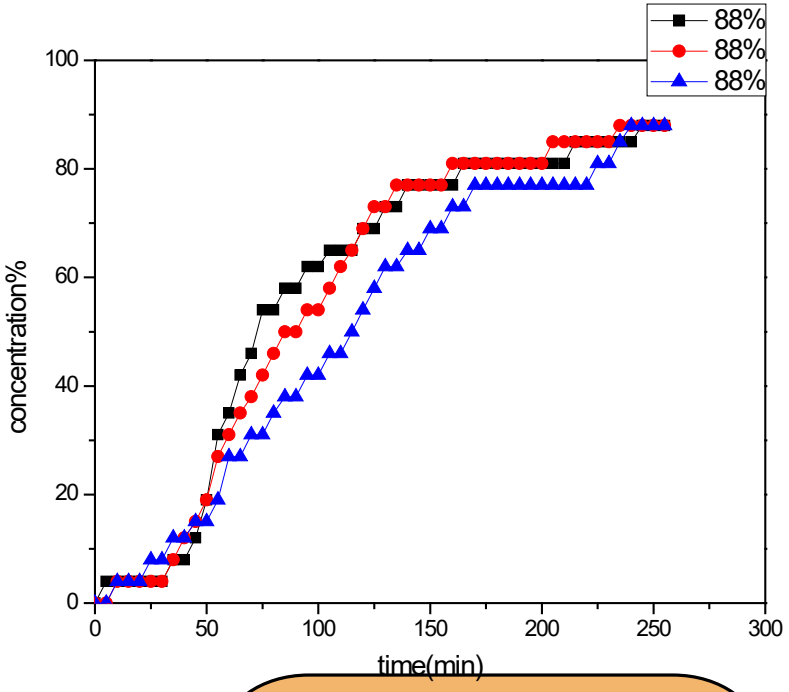
圖A、板數10

表面積1039.7mm^2



圖B、板數15

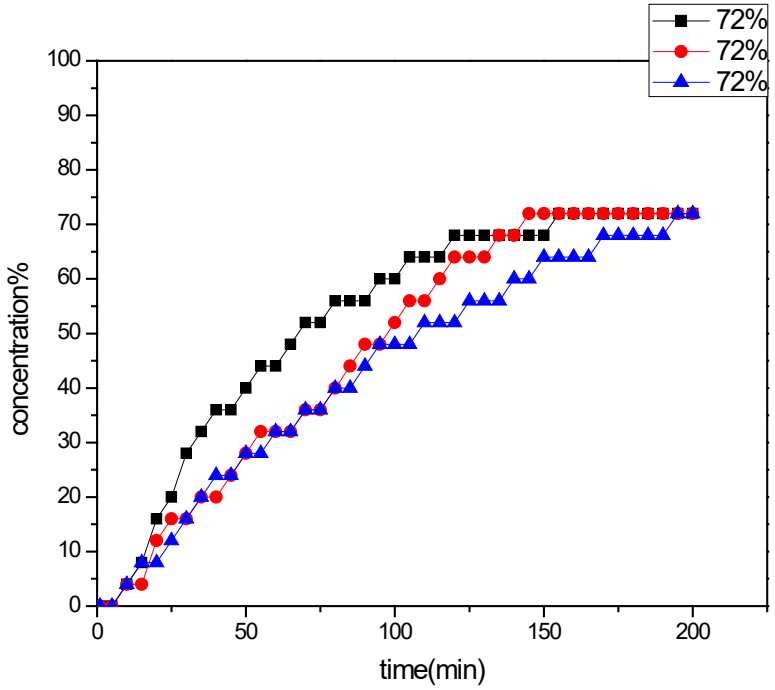
表面積1559.5mm^2



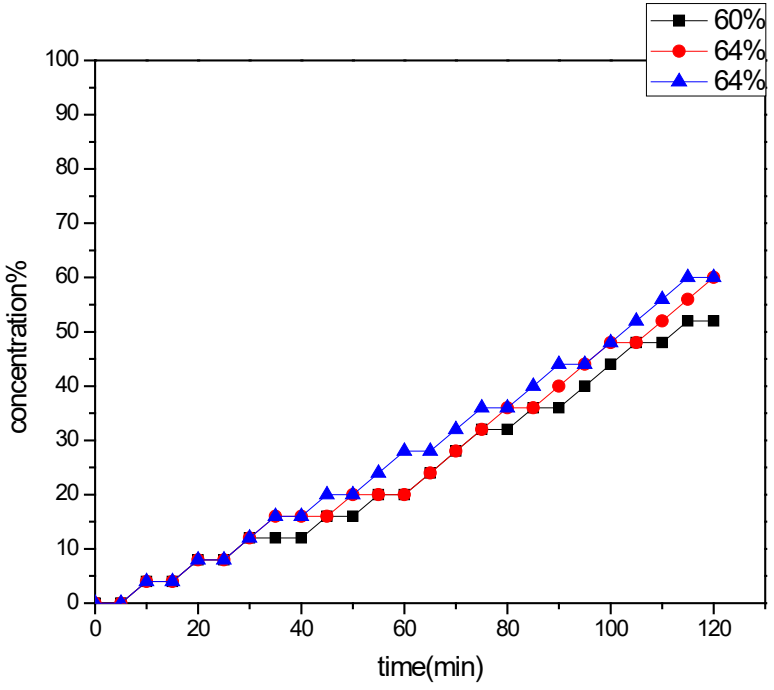
圖C、板數19

表面積1975.4mm^2

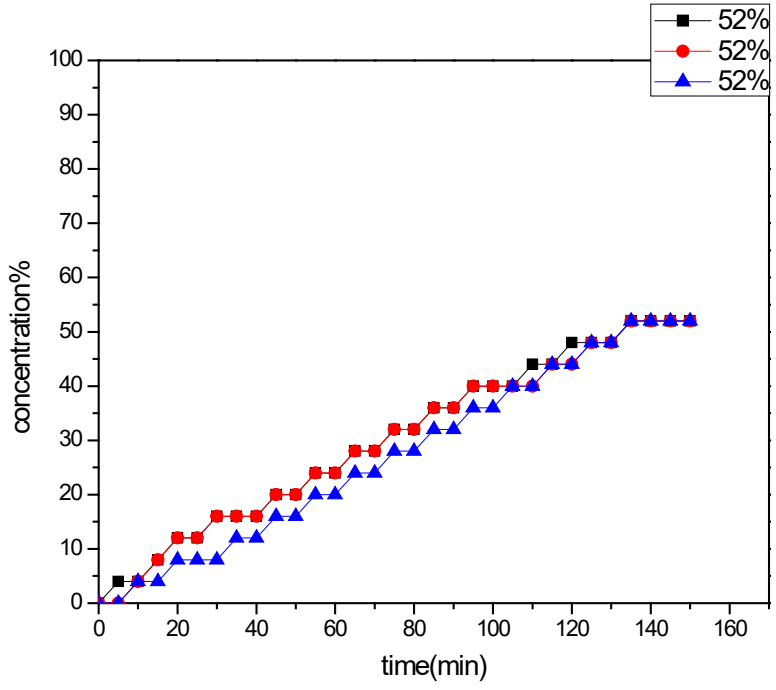
實驗變因:改變氣體流量



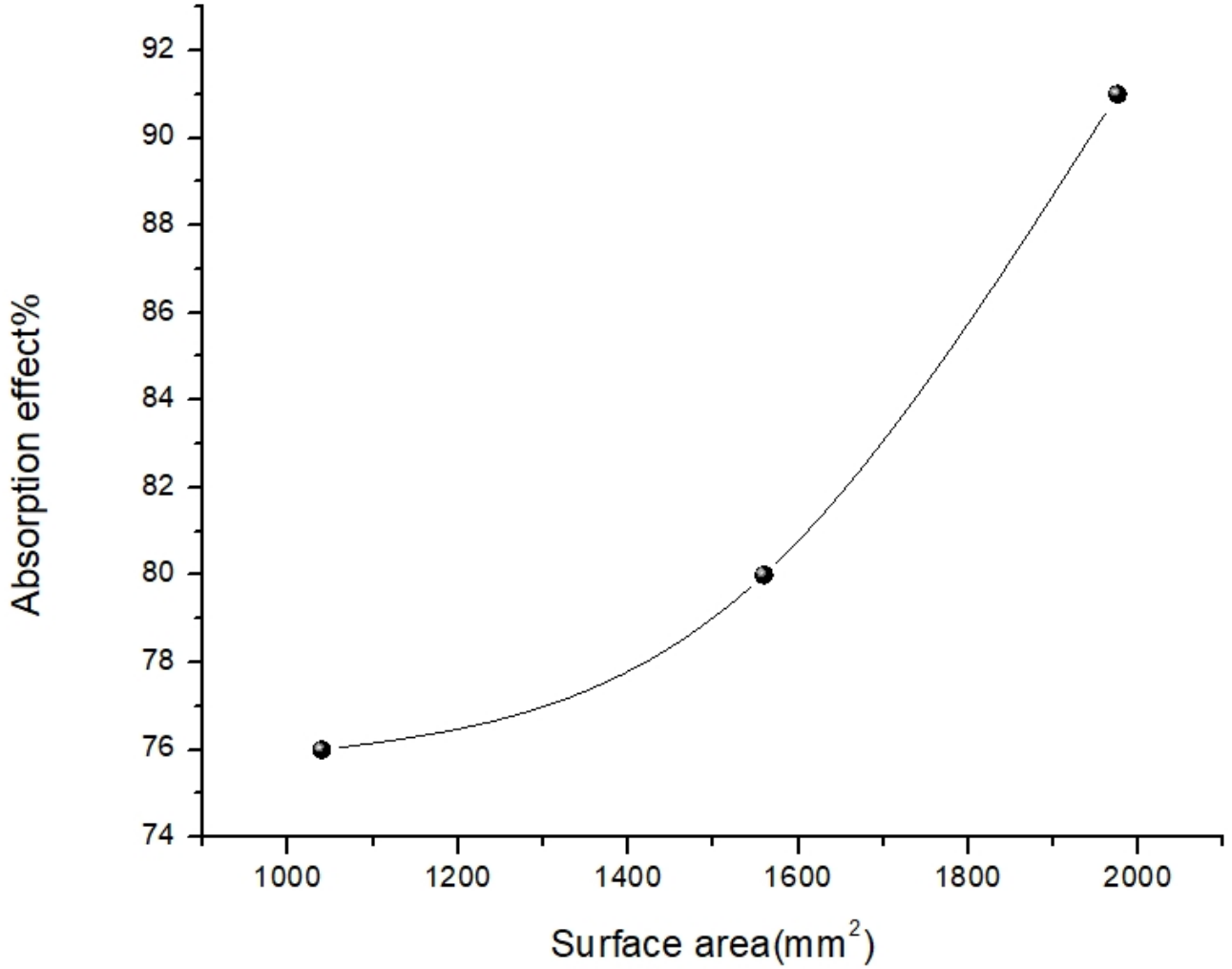
100mL/min



150mL/min

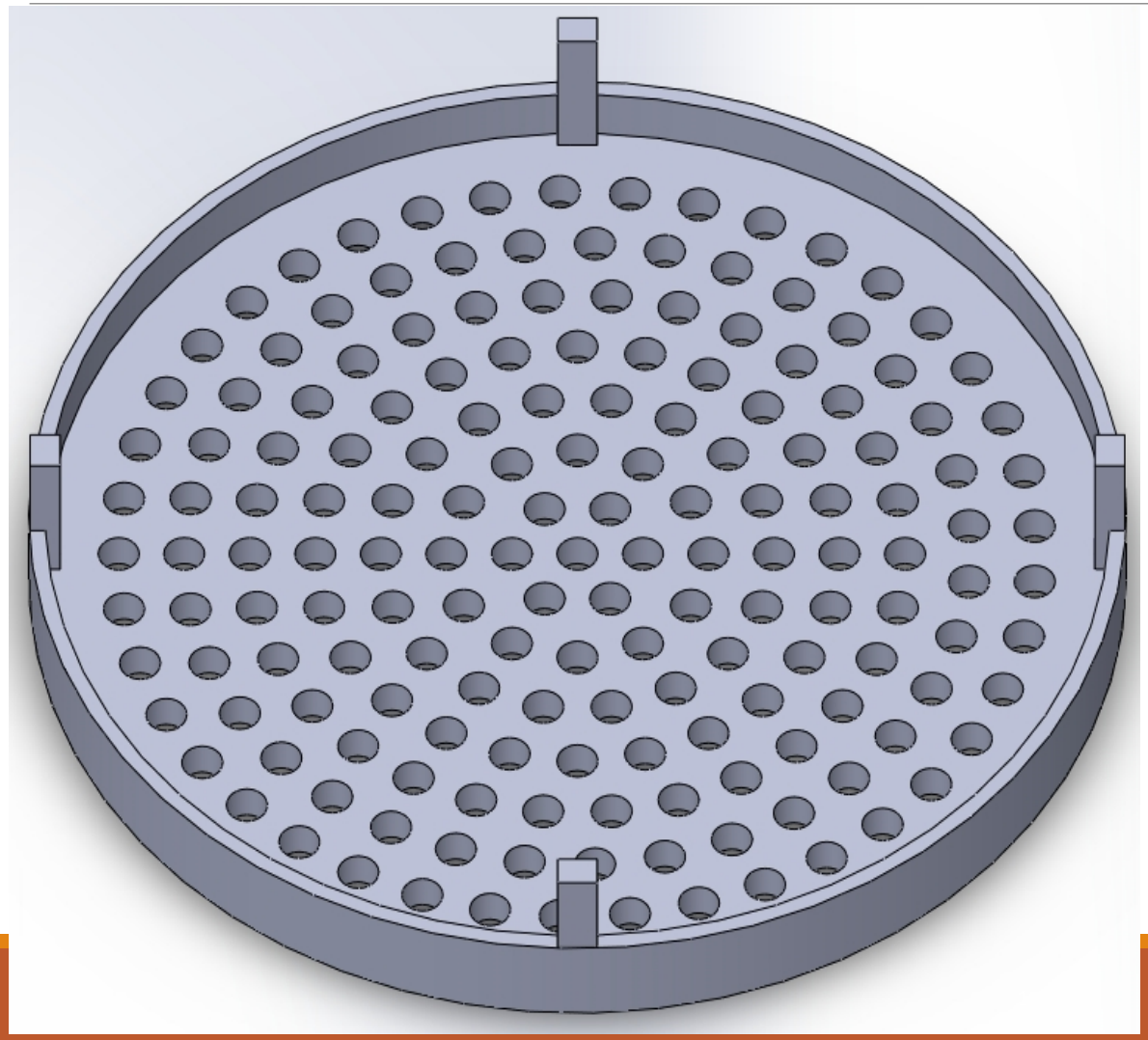


200mL/min



圖A、圖B、圖C，
吸收效果與表面積作圖

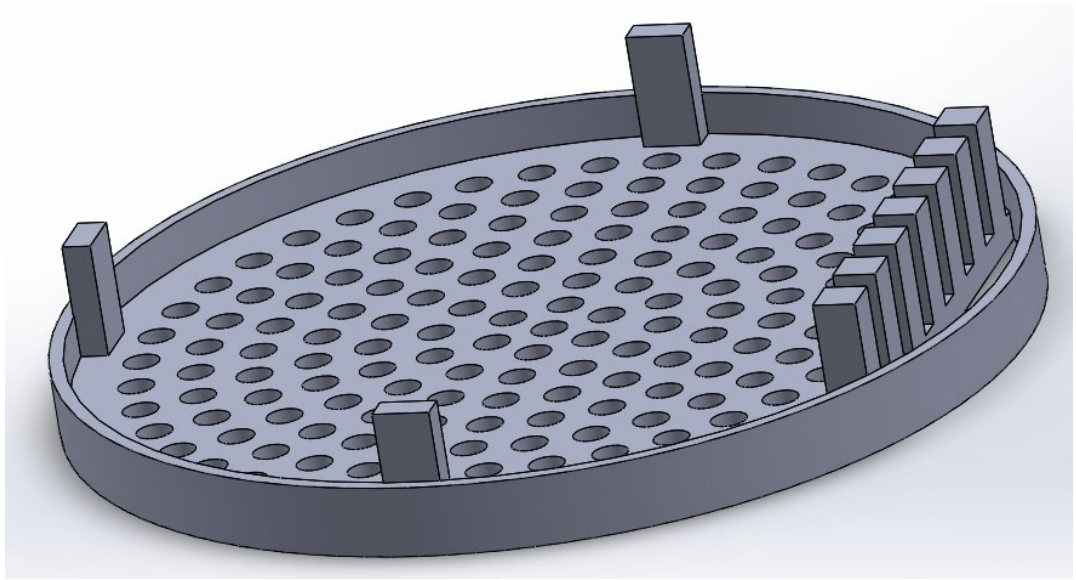
填充物



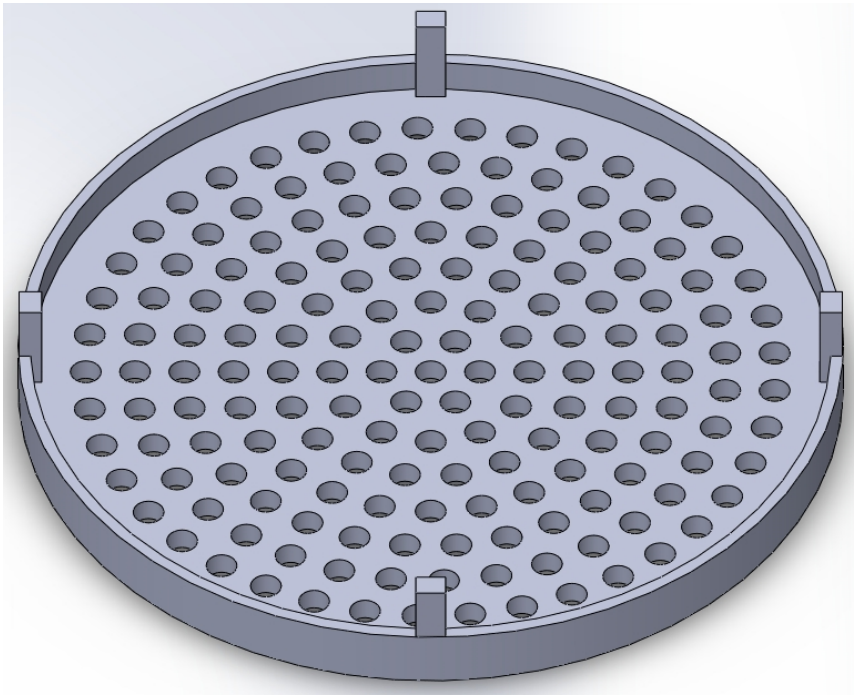
填充物二
總表面積
138.66mm^2

填充物之比較

因為在實驗中，我們觀察到醋酸鉀水溶液在吸收CO_2後，黏度會上升後，液體仍可以經過填充物一中的圓形孔洞，而因黏度上升而較少流入側邊的孔洞，所以為了提升吸收度，我們用小形圓孔取代側邊孔洞。視圖填充物二。

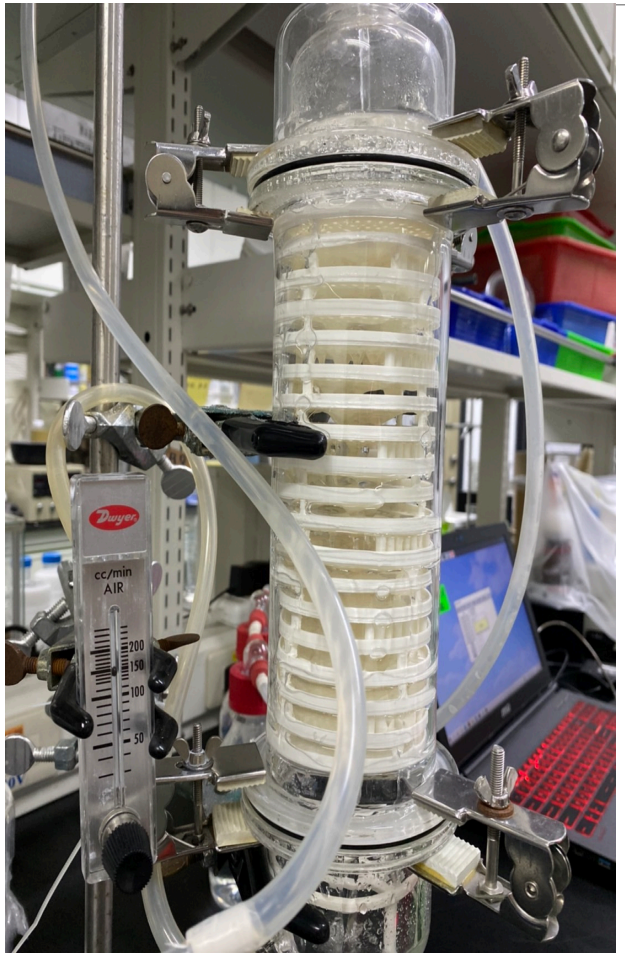


填充物一



填充物二

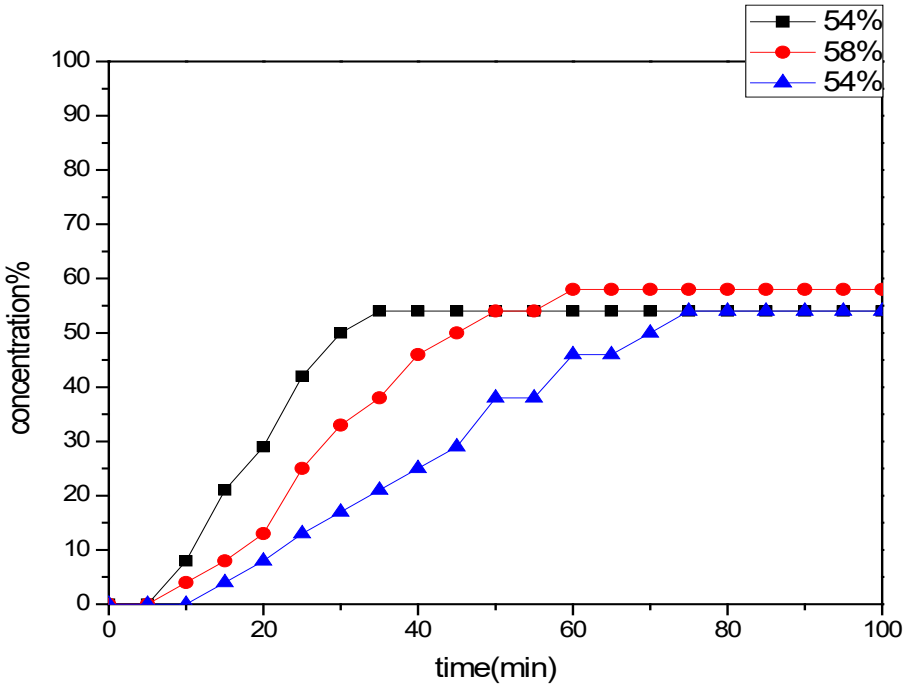
填充物的堆疊方式



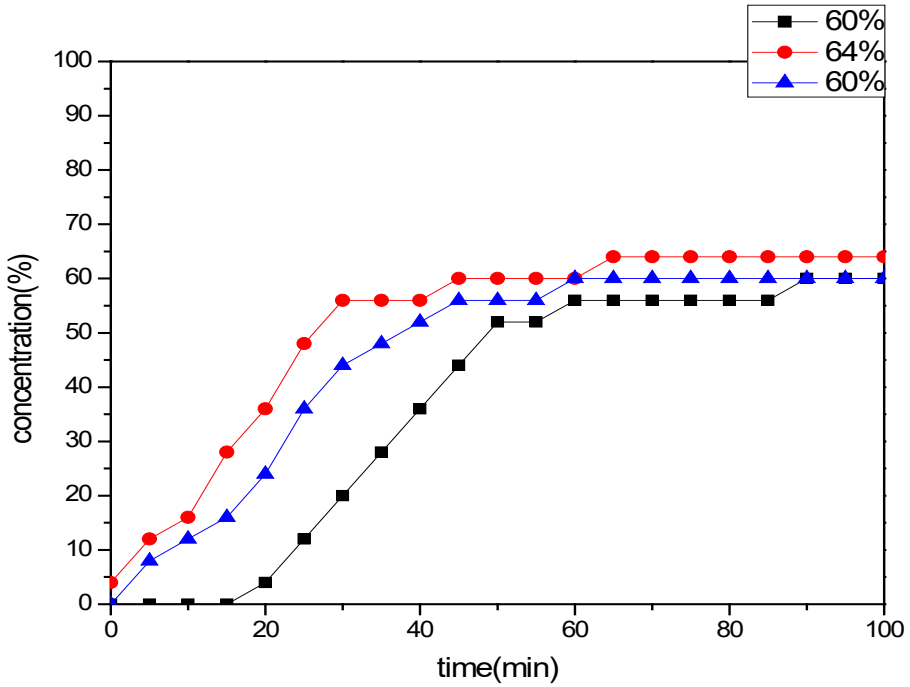
將填充物1與填充物2交錯堆疊。

實驗變因:改變填充物堆疊方式

200mL/min

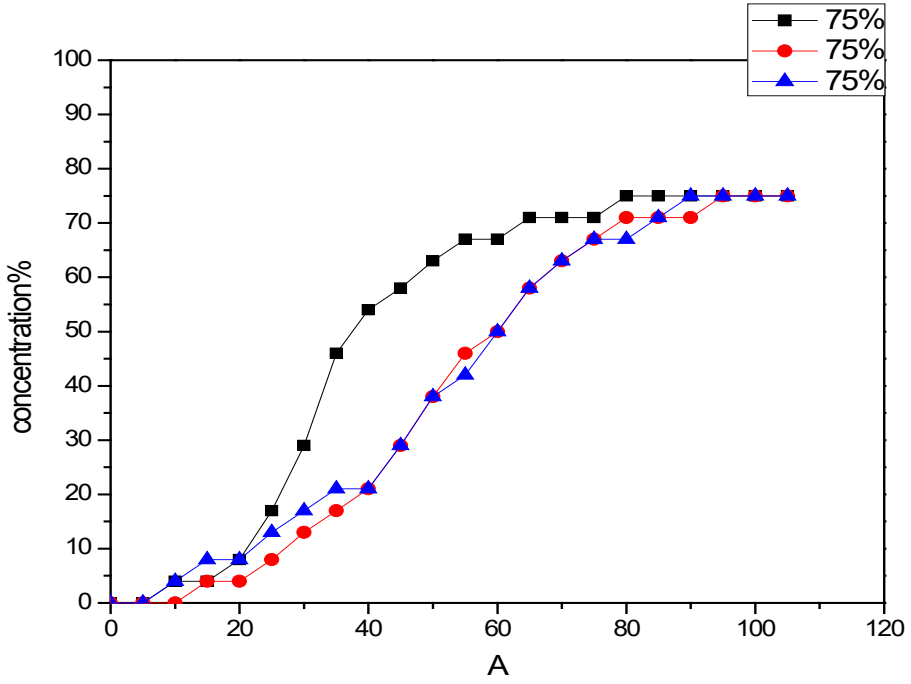


150mL/min

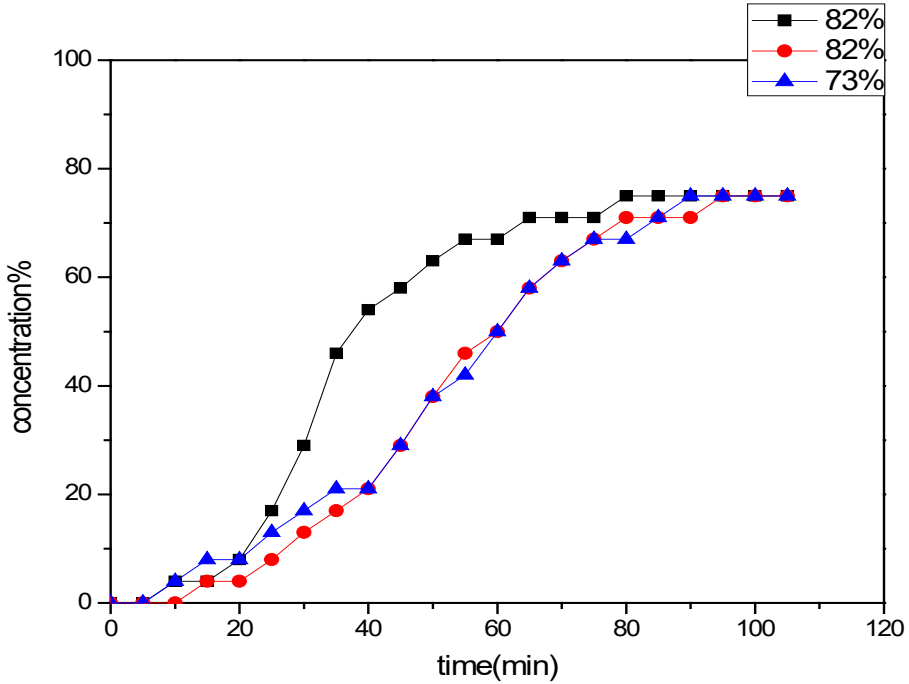


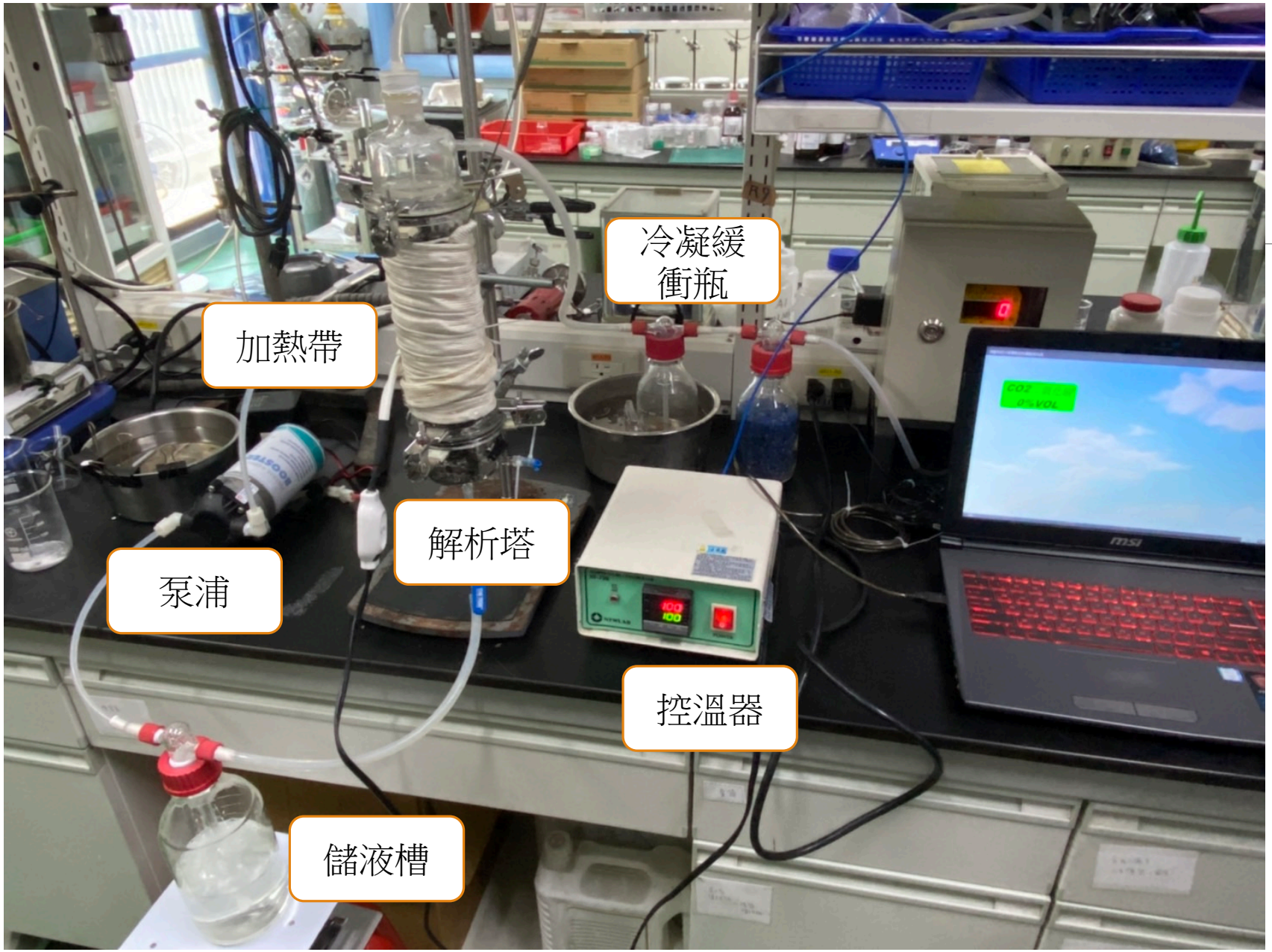
實驗變因:改變填充物堆疊方式

100mL/min



50mL/min





解析塔之操作