Surface Modification of PDMS Substrates

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Introduction

- **Advantage of PDMS**

  PDMS為一疏水性高分子材料，已被廣泛用於微鑄模製程（micro-moding process）及微流體通道（microfluidic channel）材質。其優點為具可塑性高且可高溫滅菌，透光性佳，且具良好生物相容性。

- 本研究針對PDMS作表面處理，並且經過氧電漿以及化學處理的方式，使其局部永久性地定義為親水區。將其應用於微閥開關的控制上，可對樣品流作多工的取樣以及反應，更可以將之整合於其他微流體系統。

Surface Modification of PDMS

- **Methods**
  - Oxygen plasma treatment
  - Chemical treatment
  - Stored in pure water
  - Stores in vacuum

- **Purpose**
  - Produce hydrophilic group,ex. -OH、-COOH

Prescription of PDMS Chemical Treatment

AMPS （2-Acrylamido-2-methyl-1-propanesulfonic acid,99% ）	10mg
D.I.water	1ml
1N HNO3	3~5d
Ammonium cerium(V) nitrate	5mg

Methods of PDMS surface treatment

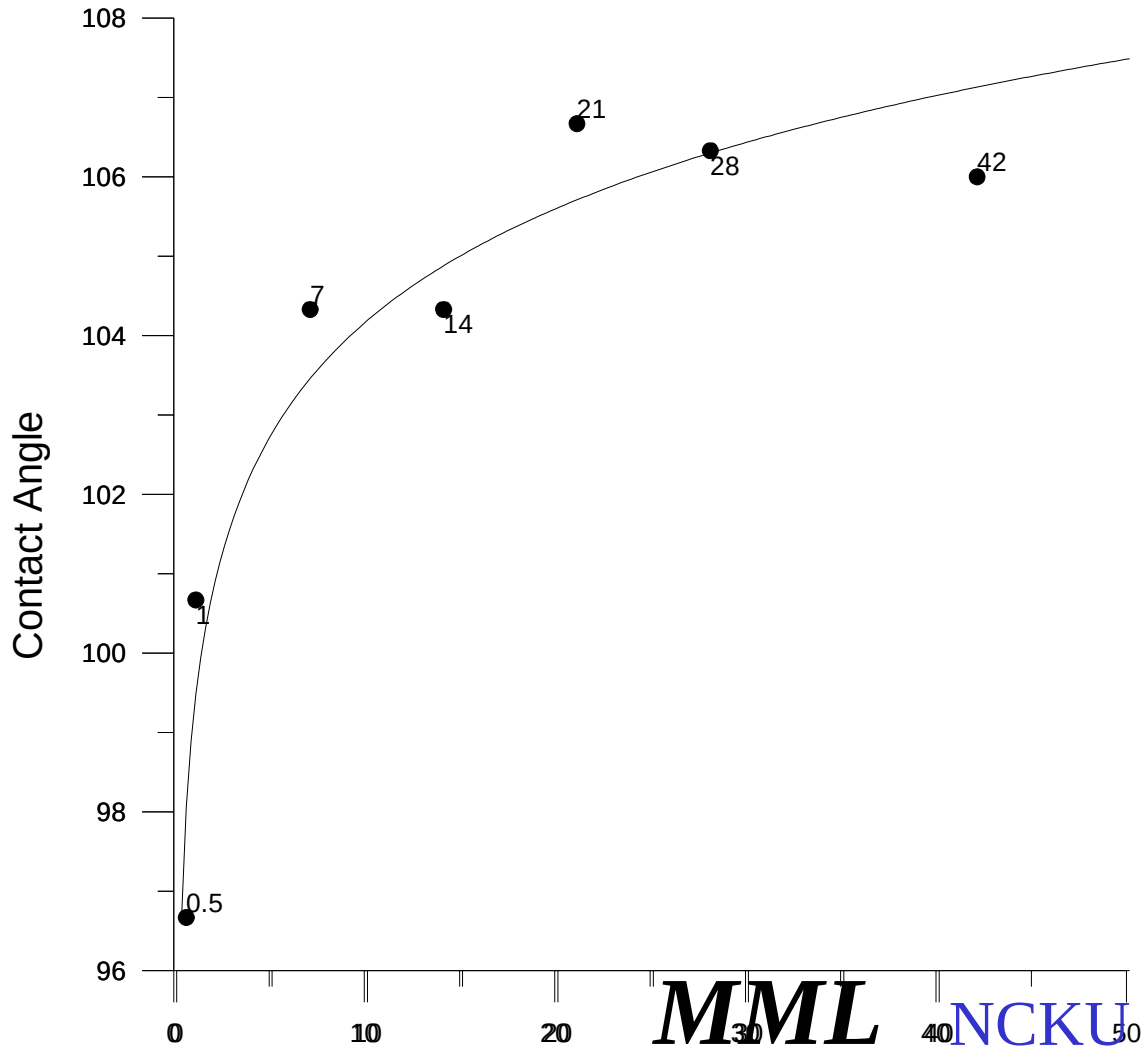
	Oxygen Plasma	Chemical Treatment	Stored in DI water
A(Native PDMS)	x	x	x
B	v	x	x
C	v	x	v
D	v	v	x
E	v	v	v

	Oxygen Plasma	Chemical Treatment	Stored in vacuum
F	v	v	v

- **Type B**

	Oxygen Plasma	Chemical Treatment	Stored in DI water
B	v	x	x

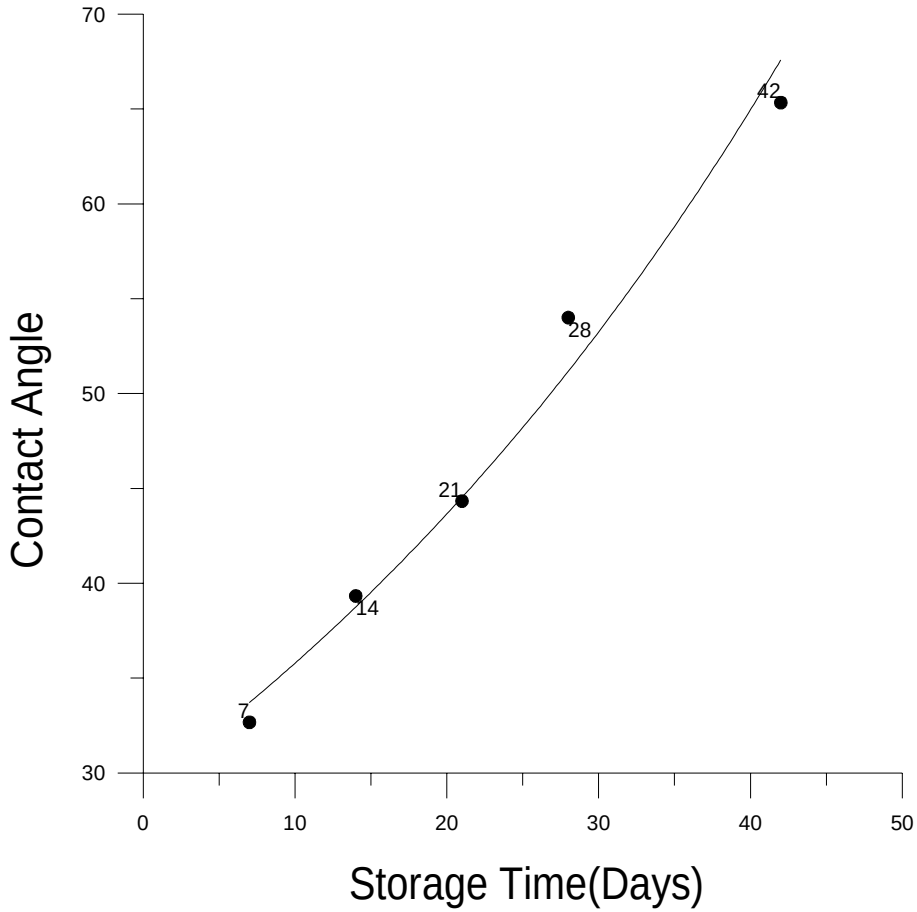
Days	Contact Angle
0.5	96.67
1	100.67
7	104.33
14	104.33
21	106.67
28	106.33
42	106.00



- **Type D**

	Oxygen Plasma	Chemical Treatment	Stored in DI water
D	v	v	x

Days	Contact Angle
0.5	<10
1	<10
7	32.67
14	39.33
21	44.33
28	54.00
42	65.33



	Oxygen Plasma	Chemical Treatment	Stored in DI water
A(Native PDMS)	x	x	x

The contact angle of Type A = 112°

	Oxygen Plasma	Chemical Treatment	Stored in DI water
C	v	x	v
E	v	v	v

The contact Angle of type C and E < 10°

	Oxygen Plasma	Chemical Treatment	Stored in vacuum
F	v	v	v

時間(day)	contact angle
1	<10°
3	<10°
5	<10°
7	<10°
14	<10°
21	<10°
28	<10°
35	<10°
42	<10°

The contact Angle of type F < 10°

Conclusions

- 經過氧電漿和化學處理後的晶片，其表面性質並不會隨著時間而改變，穩定性佳。
- 本研究成功地利用PDMS表面性質的處理，應用於新式微閥開關的控制
- 微閥開關晶片結構單一，所以可以準確地控制樣品流的動作和反應。更進一步地可以將之與其他微流體元件整合，例如微幫浦（micro pump），規劃成一完整多工樣品取樣反應系統。