Multi-channel PMMA microfluidic biosensor with integrated IDUAs for electrochemical detection

Analytical and Bioanalytical Chemistry

Electronic Supplementary Material

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Table S1 Effect of bubble generation during surface modification on IDUA

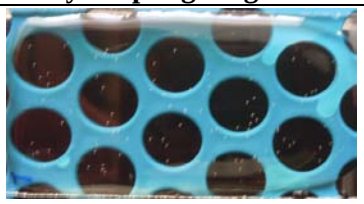
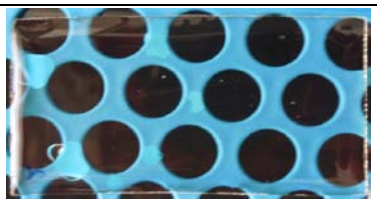
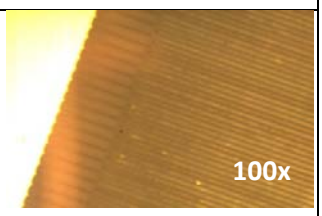
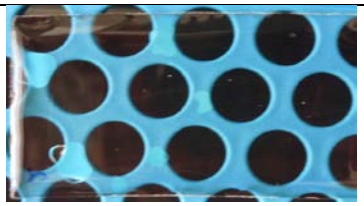
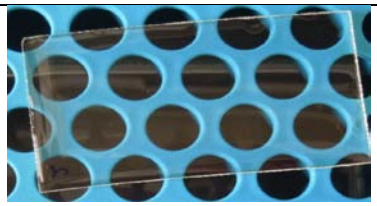
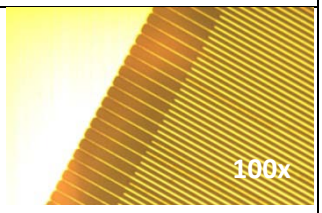
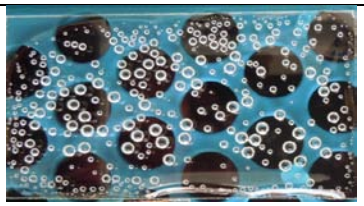
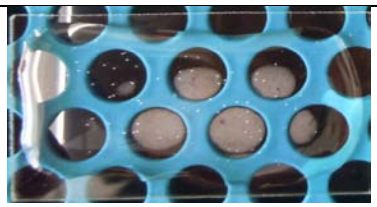
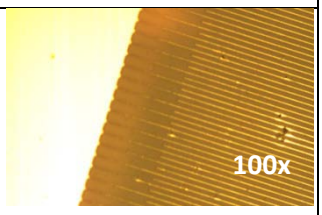
Method	PMMA surface activation by coupling reagents	Cystamine conjugation	IDUAs after etching
1	 **2 mL** of 300 mM **Sulfo-NHS** + 300 mM EDC in 0.05 M MES buffer	 **2 mL** of 300 mM **cystamine** in 0.05 M Carbonate buffer	 short circuited
2	 **1 mL** of 300 mM **Sulfo-NHS** + 300 mM EDC + **0.1% (v/v) Tween 20** in 0.05 M MES buffer	 **1 mL** of 300 mM **cystamine + 0.1% (v/v) Tween 20** in 0.05 M Carbonate buffer	 intact circuit
3	 **2 mL** of 300 mM **NHS** + 300 mM EDC in 0.05 M MES buffer	 **2 mL** of 300 mM **cystamine** in 0.05 M Carbonate buffer	 short circuited

Table S1 Effect of bubble generation during surface modification on IDUA (continued)

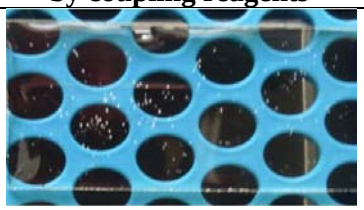
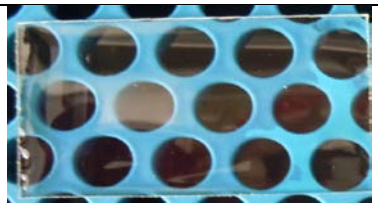
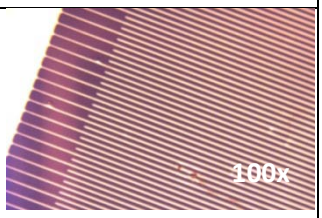
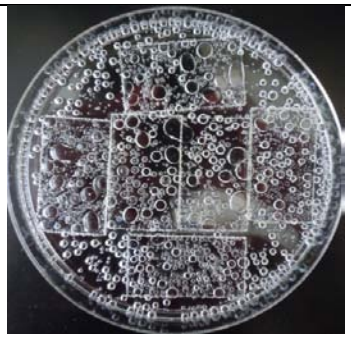
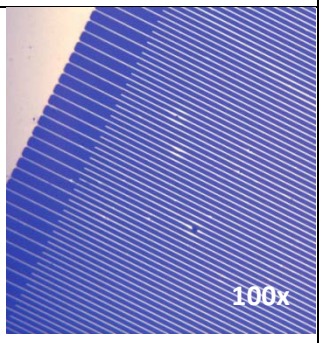
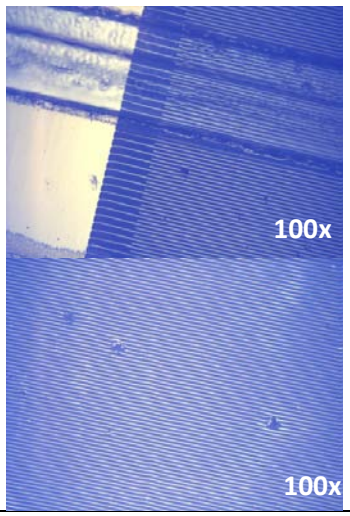
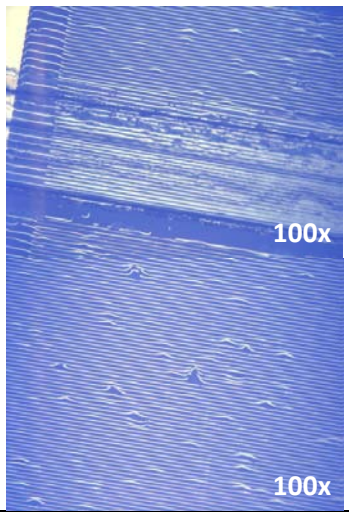
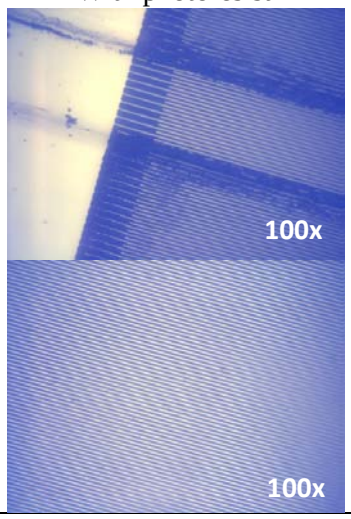
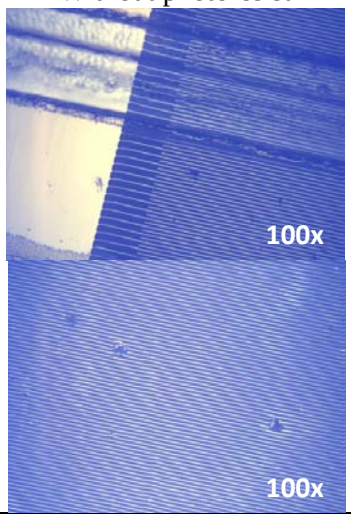
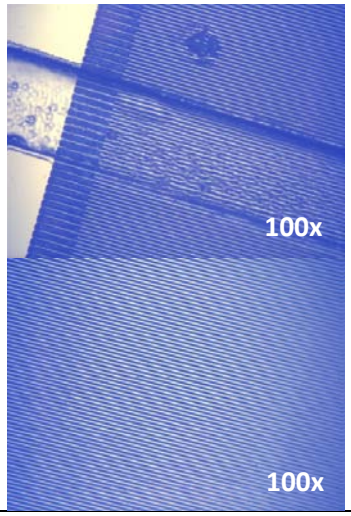
Method	PMMA surface activation by coupling reagents	Cystamine conjugation	IDUAs after etching
5	 **1 mL** of 300 mM **NHS** + 300 mM EDC + **0.1% (v/v) Tween 20** in 0.05 M MES buffer	 **1 mL** of 300 mM **cystamine + 0.1% (v/v) Tween 20** in 0.05 M Carbonate buffer	 short circuited
6	 **30 mL** of 300 mM **NHS** + 300 mM EDC in 0.05 M MES buffer	 **30 mL** of 300 mM **cystamine** in 0.05 M Carbonate buffer	 short circuited

Table S2 Optimization of bonding condition in which 4000 lbf bonding force, 8 min UV treatment time, 5 min boding time with photoresist protection were used in the end. The first column provides conditions used. In the upper images for each conditions a large view of the IDUAs with overlayed PMMA channels are shown. In the lower images a close-up of the IDUAs are shown. Defects are visible for all of the non-optimal conditions.

Parameter	Result	
Bonding pressure - UV treatment for 8 min - bonding time for 5 min - Without photoresist protection	4000 lbf 	5000 lbf 
Effect of photoresist protection - UV treatment for 8 min - bonding time for 5 min - Applied bonding pressure 4000 lbf	With photoresist 	Without photoresist 
UV treatment time - bonding time for 5 min - Applied bonding force 4000 lbf - Without photoresist protection	4 min 	8 min