

課題番号 : F-19-KT-0121  
利用形態 : 技術代行  
利用課題名(日本語) : バクテリア培養のためのマイクロ流路デバイスの作製  
Program Title (English) : Microfluidic channel fabrication for applications in microbiology  
利用者名(日本語) : ウタダ アンドリュー  
Username (English) : Utada Andrew  
所属名(日本語) : 筑波大学生命環境系  
Affiliation (English) : Faculty of Life and Environmental Sciences, Tsukuba University,  
キーワード/Keyword : リソグラフィ・露光・描画装置、バイオ&ライフサイエンス、分子テクノロジー、PDMS

### 1. 概要(Summary)

I have utilized the clean room facilities at AIST to fabricate molds for microfluidic devices. I used the Karl Suss mask aligner for photolithography to fabricate one- and two-layer masters. I replicated the features into the soft silicone elastomer called polydimethylsiloxane (PDMS). I then bond the PDMS device to glass to form a completed device. I am able to trap bacteria in chambers of about 1 micron high.

### 2. 実験(Experimental)

Spin coaters, Hot plates, and Karl Suss mask aligner.

### 3. 結果と考察(Results and Discussion)

PDMS devices are useful due to the flexibility in which new designs can be rapidly prototyped. Typically PDMS devices have a single height but I using *two* masks to make two layer thicknesses and the Karl Suss to align and expose both layers.

Bacteria are  $\sim 1\mu\text{m} \times 0.5\mu\text{m}$  in size so to visualize a monolayer of growing bacteria, we must confine them. To do so, I fabricated two-layer devices capable of trapping bacteria in a thin ( $1\text{-}5\mu\text{m}$ ), quasi-2D chamber (Fig 1A). Bacteria in this chamber grow normally and we are able to accurately monitor their growth and spatial distribution as they divide and spread (Fig 1A). We currently are trying to understand intercellular interactions by observing the behavior of the bacteria in these chambers. For example we image growth over-nighth and segment the images to determine the local density

within the colony (see Fig. 1B).

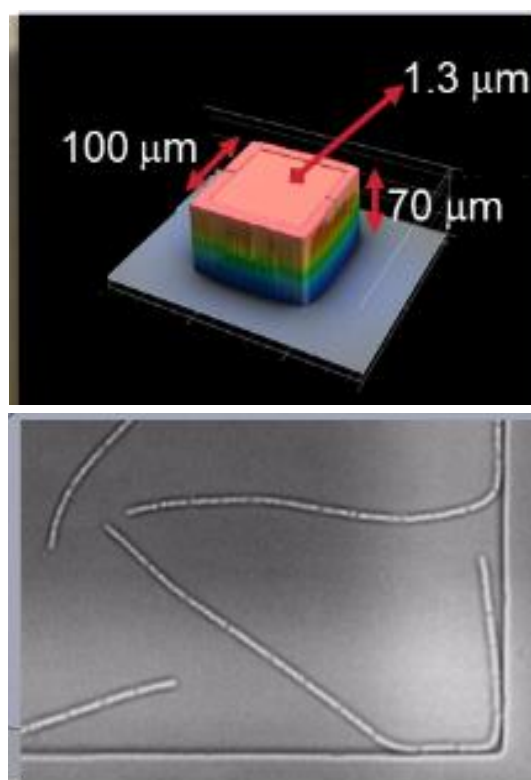


Fig. 1A (upper) A confocal scan of the chambers fabricated via photolithography using the chrome mask. (inset) A schematic of the device showing a schematic image of the channel containing the chambers and bacteria. Fig. 1B (lower) Bacteria growing in a PDMS device replicated from a mold fabricated at Univ. Tsukuba.

### 4. その他・特記事項(Others) なし

### 5. 論文・学会発表(Publication/Presentation)

T. Kunoh, A. S. Utada ACS Nano, Published 12/5/2019

### 6. 関連特許(Patent) なし