

課題番号 : F-19-AT-0136  
利用形態 : 機器利用  
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 ANDEW  
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, microfluidic, micro-device, bacteria, microbiology

## 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)

【利用した主な装置】スピコーター、コンタクトマスクアライナー[MJB4]、ドラフトチャンバー

### 【実験方法】

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.

## 3. 結果と考察(Results and Discussion)

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. 1 upper). Bacteria in this chamber grow normally and we are able to accurately monitor their growth and spatial distribution as they divide and spread (Fig. 1 upper). We currently are trying to understand intercellular interactions by observing the behavior of the bacteria in these chambers. For example we image growth

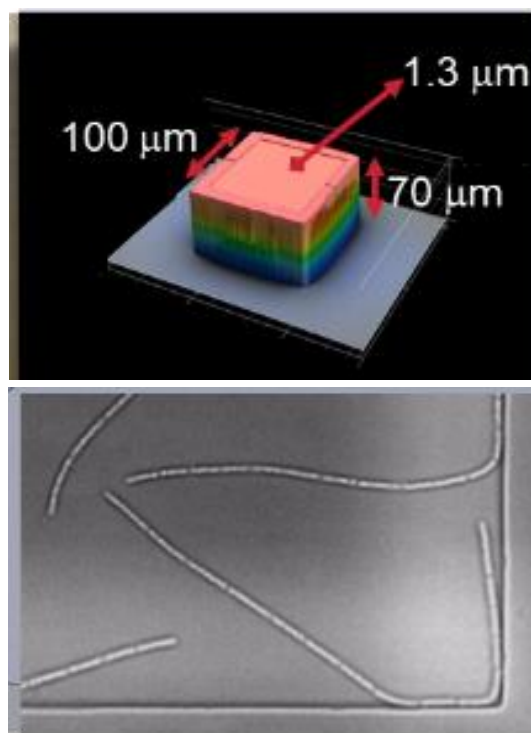


Fig 1. (upper) A confocal scan of the chambers fabricated via photolithography using the chrome mask. (inset) A schematic of the device showing a schematic image of the channel containing the chambers and bacteria. (lower) Bacteria growing in a PDMS device replicated from a mold fabricated at Univ. Tsukuba.

over-night and segment the images to determine the local density within the colony (see Fig. 1 lower).

4. その他・特記事項(Others) なし。

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

1) T. Kunoh, K.Morinaga, S. Sugimoto, S. Miyazaki, M.Toyofuku, K. Iwasaki, N.Nomura and A. S. Utada\*, *ACS Nano*, Published 12/5/2019

6. 関連特許(Patent) なし。