課題番号　　:F-18-AT-0116
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
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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. After fabricating the master, I replicated the features into the soft silicone elastomer called polydimethylsiloxane (PDMS). I subsequently bond the PDMS device to glass to form a completed device. I am able to trap bacteria in chambers of about 1 micron high. We are analyzing the data we have.

2. 実験（Experimental）

【利用した主な装置】

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【実験方法】

Bacteria have been shown to be able to be cultured in PDMS devices. These devices are useful due to the flexibility in which new designs can be rapidly prototyped. Typically PDMS devices have a single height but I overcome this limitation by using *two* masks and use the spin-coaters to define the two layer thicknesses and the Karl Suss to align and expose both layers.

3. 結果と考察（Results and Discussion）

Bacteria are typically approximately 1 μm x 0.5 μm in size. Therefore, to visualize a monolayer of growing bacteria, we must confine them to two dimensions. To do so, I have successfully fabricated two-layer devices capable of trapping bacteria in a thin (1-5 μm), quasi-2D chamber (Fig. 1). Bacteria in this chamber grow normally and we are able to accurately monitor their growth and spatial

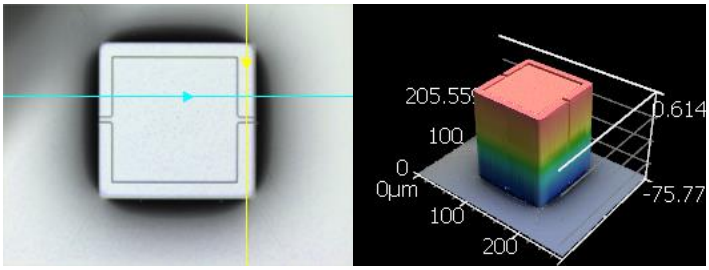

Fig. 1. (a) Image of 2D chamber (grayscale). (b) Height-colored 3D image of PDMS chamber.

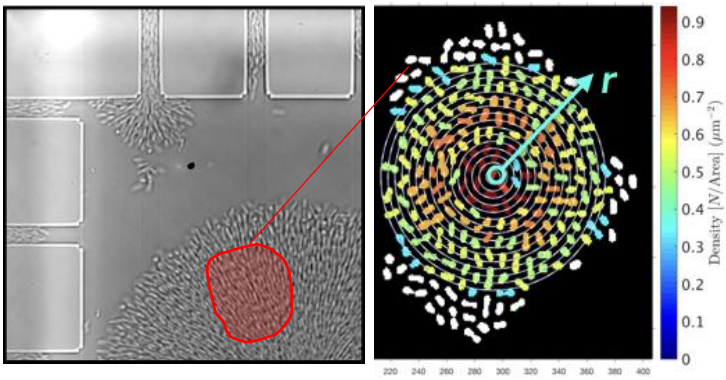

Fig. 2. (a) Bacteria growing in a two-dimensional PDMS chamber device replicated from an SU-8 mold. (b) Colony showing internal local order and density.

distribution as they divide and spread (Fig. 2a). We currently are trying to understand intercellular interactions by observing the behavior of the bacteria in these chambers. For example we image growth over-nigth and segment the images to determine the local density within the colony (see fig 2b).

4. その他・特記事項（Others）

なし

5. 論文・学会発表（Publication/Presentation）

なし

6. 関連特許（Patent）

なし