課題番号　:F-19-KT-0150
利用形態　:機器利用
利用課題名（日本語）　:生体分子、細胞、組織操作のためのマイクロ・ナノデバイス開発（２）
Program Title (English)　:Development of micro/nano devices for manipulations of molecules, cells, and tissues(2)
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キーワード／Keyword　:バイオ＆ライフサイエンス、リソグラフィ・露光・描画装置、ナノピラー、電子線描画

1. 概要（Summary）

Biomolecular motor systems consisting of cytoskeletal filaments microtubule (MT) and associated motor-proteins, e.g., kinesin have been envisioned as promising candidates for constructing future artificial biomachines owing to their outstanding property of converting chemical energy to mechanical work. The efficiency of these systems can be amplified through assembling biomolecular motors into ordered structures as observed in muscles, stress fibers, flagellum and mitotic spindle in vivo. So far, the works done to integrate the biomolecular motor systems lack in a proper ordered arrangement of motor-proteins and provide inadequate quantitative information. Therefore we aim to pattern the motor-proteins in a systematic manner using gold nano-pillars at nanoscale level followed by studying the influence of patterning of motor-proteins on MTs motility.

2. 実験（Experimental）

【利用した主な装置】

A15 ultra-high precision electron beam lithography system

【実験方法】

An electron beam resist (ZEP-520A, ZEON) was coated on a Si substrate, followed by drawing a nano-pillar pattern with a diameter of 50 nm and adjustable intervals (200 to 1000 nm) using the A15 mm large-area ultra-high-precision electron beam writing system. After the development of the pillar pattern, the gold nano-pillar array was fabricated by performing the processes of gold deposition and lift-off. Polyethylene glycol (PEG), which suppresses protein adsorption, was selectively grafted onto the gold patterned silicon substrate. Kinesin was selectively immobilized on gold nano-pillar by biotin-avidin binding. A mixed solution of MTs and ATP was introduced, and the motility of MTs on the patterned kinesin was monitored.

3. 結果と考察（Results and Discussion）

Fig 1a, shows the SEM image of the fabricated nano-pillars. The fluorescence microscopic images of MTs (in fig 1b) show that on randomly immobilized kinesin (glass surface) MT filaments move individually without showing any coordinated motion. The kinesin patterning (on nano-pillars) regulates the MTs movement and assembled them to bundles at lower spacing (200 nm).

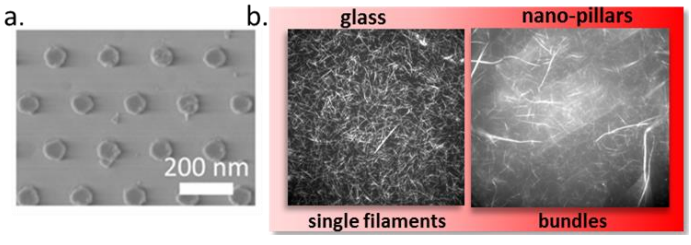

Fig. 1 a) SEM image of nano-pillar after patterning and lift-off process. b) The effect of kinesin patterning on MTs coordinate behavior.

4. その他・特記事項（Others）

本研究は文部科学省ナノテクノロジープラットフォーム（課題番号 JPMXP09F19KT0107）の助成を受けたもので

す。

5. 論文・学会発表（Publication/Presentation）

(1) T. I. Farhana *et al.* TRANSDUCERS & EUROSENSORS XXXIII, Berlin, Germany, 2019/6/23-27.

(2) T. I. Farhana *et al.*, CHEMINAS 40th, ACT City, Hamamatsu, 2019/11/19-21.

6. 関連特許（Patent） なし