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利用形態 :機器利用
利用課題名（日本語） :バイオセンシング用デバイス作製プロセスの開発
Program Title (English) :Development of device fabrication process for biosensing application
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1. 概要（Summary）

The main objective of this project is to create a sensing platform on electrical measurement for biosensor devices. For electrical measurement, surface design is important for anchoring bioactive molecules. In this project, one of the steps is to modified surface with silane coupling molecule that could be immobilized with the biomolecules. In the meantime, the small chamber with gold electrode needs to be fabricated with special requirement where the chamber must be occupied with several microliter liquids.

2. 実験（Experimental）

【Equipments】

AFM(E-Sweep), Maskless Lithography (LED drawing system), Mask Aligner, BURUKER DektakXT, RF sputtering (SiO_2), DC / RF sputtering (Gold).

【Process】

The silicon dioxide (SiO_2) thin film was fabricated on silicon substrate by using the RF sputtering machine. The SiO_2 substrate has been used to fabricate the self-assembly monolayer composing of silane coupling agents. AFM has been used to investigate the surface structure, roughness and thickness of self-assembly monolayer.

Meanwhile, the Maskless Lithography was used to pattern the gold electrodes on the SiO_2 and glass substrate. The chamber of gold electrode has been fabricated using the SU-8 material, which is pattern, by Mask aligner. The BURUKER DektakXT has been used to measure the thickness of chamber with SU-8 photoresist on the glass.

3. 結果と考察（Results and Discussion）

RF sputtering was used to deposit SiO_2 on the native oxide silicon wafer. The thickness was ~6-7nm. We optimized the SAM layer formation by selecting several different solvents and varying coupling reaction time. Fig. 1 shows an AFM image of the silane-modified SiO_2 surface obtained by the optimized condition. As a result, the optimization of the process could be done.

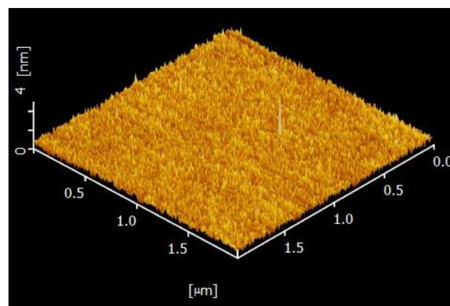

Fig.1: AFM measurement for silane modified on SiO_2 surface.

The DC/RF gold deposition machine has been used to fabricate the titanium nitrate (50nm) and Aurum thin film (100nm) on glass substrates. After that, the SU-8 has been used to form the small chamber. The thickness for SU-8 must be not more than 20-25 μm. As in Fig. 2, the optimization for the SU-8 thickness as thin film chamber on the electrode for the gold chamber has been successful.

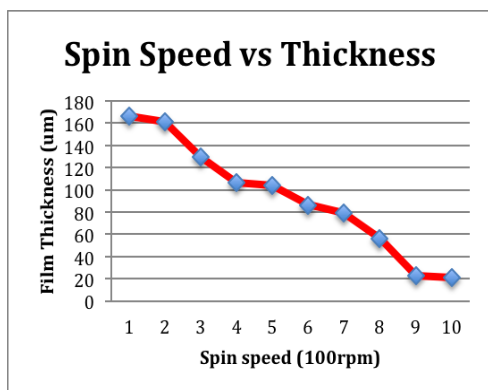

Fig.2: The graph for Optimization of SU-8 fabrication process.

4. その他・特記事項（Others）

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5. 論文・学会発表（Publication/Presentation）

Presentation: N. Sabani, K. Nobusawa, I. Yamashita, R.K. Verma, K. Nakatani, JSAP Autumn Meeting 2015 (14th Sept 2015)"Comparison of procedures on the formation of epoxy-terminated self-assembled monolayer".

6. 関連特許（Patent）

None