

課題番号 : F-21-TU-0067  
 利用形態 : 機器利用  
 利用課題名(日本語) :  
 Program Title (English) : IoT for Safety and Security  
 利用者名(日本語) :  
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 キーワード/Keyword : Energy harvesting, film deposition, sputtering、エナジーハーベスタ、成膜・膜堆積

### 1. 概要(Summary)

For developing MEMS devices towards to “Internet of Things (IoT)s for safety and Security“, it is crucial to establish cost-effectively batch manufacturing process. We partially use the facility at the Center for Integrated Nano Technology Support (CINTS, Tohoku University) to conduct our experiments.

### 2. 実験(Experimental)

【利用した主な装置】 We mainly used the following research tool: Shibaura Mechatronics !-Miller CFS-4EP-LL, F-TU-075). 自動搬送芝浦スパッタ装置

【実験方法】: Experimental method

Our 500- $\mu\text{m}$  Si and SUS wafers were cleaned by standard clean procedure and were deposited various metal thin films – Pt (200 nm)/Ti (5 nm) for a bottom electrode and a seed layer, Au (200 nm)/Cr (5 nm) or Au (200 nm)/Ti (5 nm) for a top electrode, and Ni (600 nm) for a hard mask of AlN dry etching process.

The based pressure was kept below  $5 \times 10^{-4}$  Pa and the substrates were heated up to 200 °C for Pt/Ti films. For the metal thin films, the depositions were conducted at Ar pressure of 0.5 Pa and RF power of 300 W for Au, Ni, and Pt and 100 W for Ti and Cr.

### 3. 結果と考察(Results and Discussion)

Since Pt/Ti films with low residual stress and a small full width at half maximum (FWHM) of (111)-Pt rocking curve were crucial for our AlN development. Figure 1 shows our typical rocking-curve FWHM of 2.3 deg. Figure 2 shows a CCD

camera microscope at our laboratory to observe the Au/Cr film surface images.

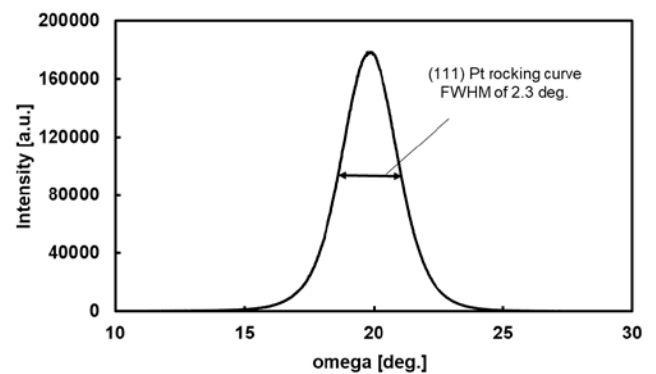


Fig. 1 X-ray diffraction rocking curve scanning of (111) Pt thin film on Si wafer.

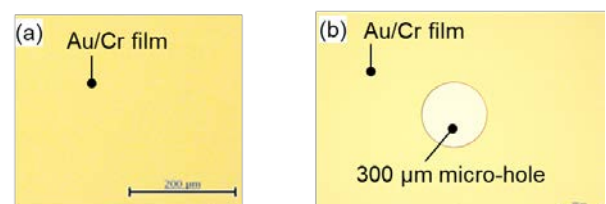


Fig. 2 CCD microscopic images of the typical Au/Cr as-deposited surface (a), after forming micro-hole (b).

### 4. その他・特記事項(Others)

なし

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

- (1) Le Van Minh and Hiroki Kuwano, *The 34<sup>th</sup> International Conference on Micro Electro Mechanical Systems (MEMS), Gainesville, FL, USA, 2021, pp.242-245, doi: 10.1109/MEMS51782.2021.9375199*

### 6. 関連特許(Patent)

なし