

利用課題番号 : F-13-KT-0023  
 利用形態 : 技術補助  
 利用課題名 (日本語) : カーボンナノチューブの機械特性評価のための MEMS 引張試験デバイスの製作  
 Program Title (English) : Fabrication of MEMS tensile testing device for mechanical properties characterization of single-walled carbon nanotubes  
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1. 概要 (Summary) :

MEMS tensile testing device for SWCNT using thermal actuator and electrolessly deposited gold layer for clamping was fabricated (See Fig.1). SWCNT displacement was measured under SEM and the resistance change was also measured for the purpose of Gauge factor calculation.

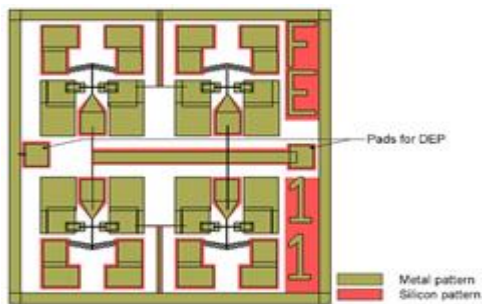


Fig.1 MEMS tensile testing device

2. 実験 (Experimental) :

- Machine name: B8 RIE-800PB-KU  
B54 PEM-800 Double Side Aligner
- Sample: SOI wafer
- Fabrication procedures (See Fig. 2)
  - (1) Cleaning: SOI wafer (Si: 5 μm, SiO<sub>2</sub>: 2 μm, Si: 400 μm) by H<sub>2</sub>O<sub>2</sub>(20 ml) + H<sub>2</sub>SO<sub>4</sub> (80 ml) for 10 min
  - (2) After dehydration bake, we form a nega resist (AZ-5214E) by spin coater, and then pattern electrode shape by photolithography.
  - (3) EB deposition for Cr/Au /Ti (thickness 5nm/30 nm/ 5 nm)
  - (4) Lift off process by NMP
  - (5) After dehydration bake, we form a posi resist (OFPR-800) by spin coater, and then

pattern electrode shape by photolithography.

- (6) ICP-RIE.
- (7) Removing photo resist by H<sub>2</sub>O<sub>2</sub>(20 ml) + H<sub>2</sub>SO<sub>4</sub> (80 ml) for 10 min
- (8) Removing Cr mask by Cr etchant
- (9) After coating photo resist for device protection, we cut the wafer for tip.

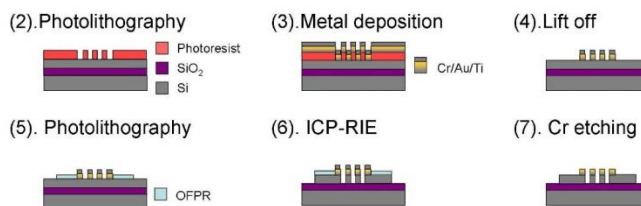


Fig.2 RIE process

3. 結果と考察 (Results and Discussion) :

We succeeded to fabricate the device and to assemble SWCNT as illustrated in Fig.3.

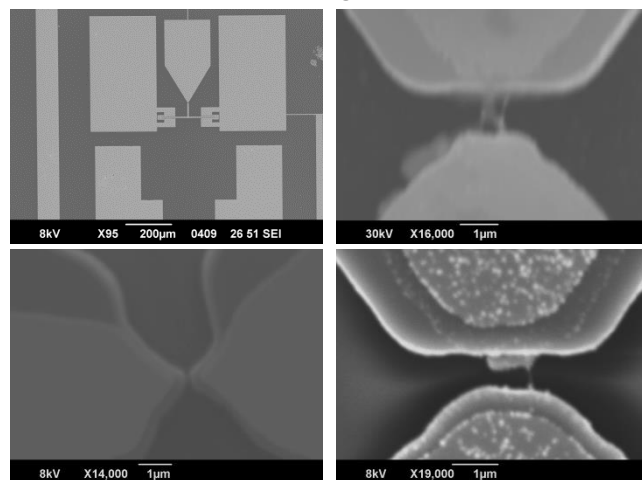


Fig. 3 Fabricated device and SWCNT assemble.

4. その他・特記事項 (Others) :

None

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

None

6. 関連特許 (Patent) :

None