

課題番号 : F-16-KT-0092  
 利用形態 : 装置利用  
 利用課題名(日本語) : DLC 薄膜でコーティングしたシリコンマイクロ構造の引張試験  
 Program Title(English) : Tensile testing of silicon microstructure coated with nano-scaled DLC film  
 利用者名(日本語) : 張 文磊, 土屋 智由  
 Username(English) : W. Zhang, T. Tsuchiya  
 所属名(日本語) : 京都大学 工学研究科 マイクロエンジニアリング専攻  
 Affiliation(English) : Department of Micro Engineering, Kyoto University

### 1. 概要(Summary)

In order to improve the mechanical reliability of silicon device, we are investigating DLC coating on silicon microstructures. In this experiments, single crystal silicon specimens for DLC coating are fabricated and coated it DLC film at different bias voltage. The tensile test has been done and an increase in mechanical strength has been proved.

### 2. 実験(Experimental)

#### 【利用した主な装置】

- [A3] Laser pattern generator
- [A54] Double-sided mask aligner
- [B8] Reactive ion deep silicone etcher
- [C22] Nano-indenter

#### 【実験方法】

Tensile specimens were fabricated using SOI wafer. A54 was used for the upper and lower side photolithography while the B8 was used for silicon trench etching from the both sides (Fig. 1(a)). PECVD was used for the full-covered DLC (diamond - like carbon )coating at the fabricated specimens with different deposition bias.

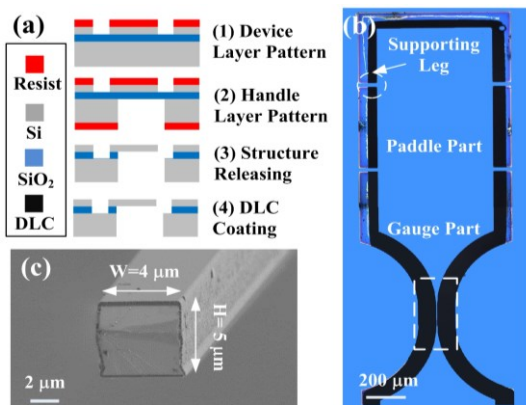


Fig.1 Sample fabrication.

### 3. 結果と考察(Results and Discussion)

The SCS microscale structures were conformally coated with DLC film at all surface (Figs. 1(b)~(c)). The tensile strength of SCS (single crystal silicon) microstructures was improved by DLC coating up to 53.5% and the improvement became larger with increasing the bias voltage (Fig. 2).

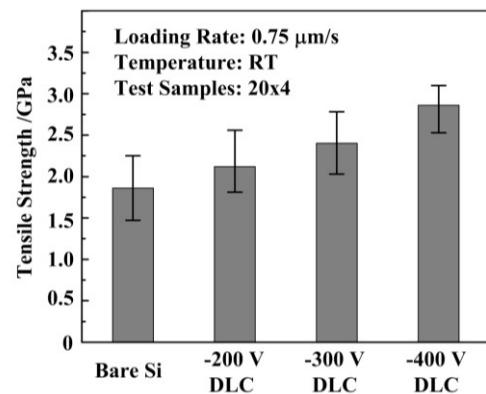


Fig.2 Tensile test result.

### 4. その他・特記事項(Others)

#### ・関連文献

W. Zhang, A. Uesugi, Y. Hirai, T. Tsuchiya and O. Tabata, MEMS 2017, Las Vegas, NV, USA, (January 22-26, 2017), W-099, pp.732-735.

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

なし。

### 6. 関連特許(Patent)

なし。