

Low Mass Density RF Actuators

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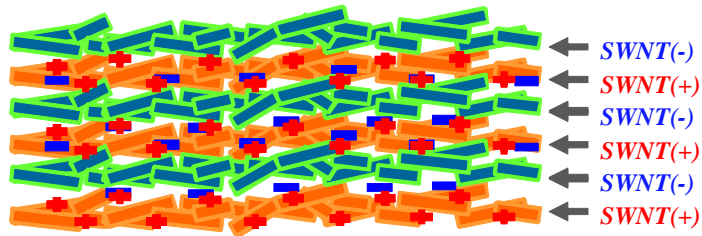
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NNIN Facility utilized: Nanofabrication Center

● Goal of Project

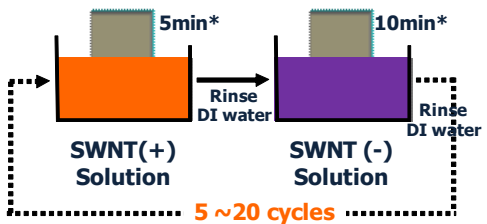
- 1) Development of All Single Walled Carbon Nanotube (SWNT) Film using Layer-by-Layer deposition process
- 2) Demonstration of Reliable and Fast 3-Terminal Actuators
- 3) Implementation of High speed MEMS Digital Logic Circuits



■ Sample pre-treatment

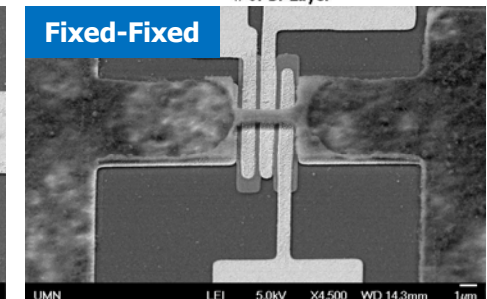
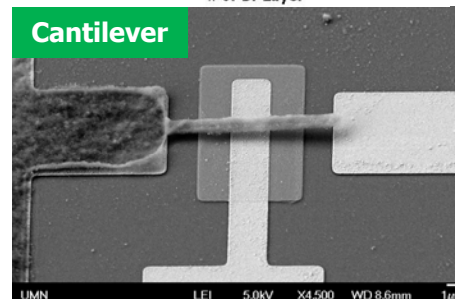
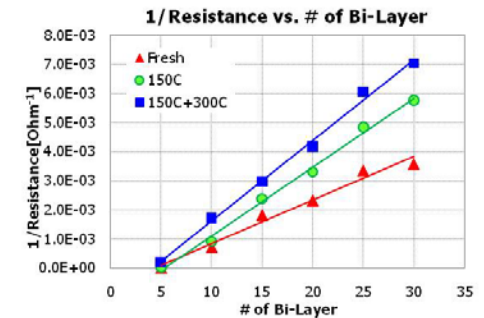
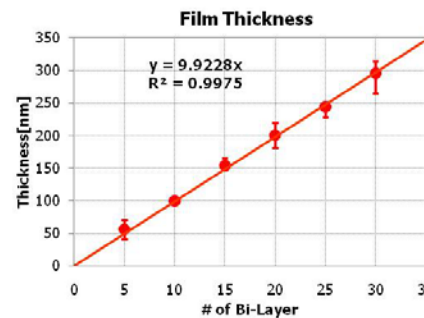
To make it be **negatively charged**
(**O₂ plasma** or **Piranha** cleaning)

■ L-b-L Self Assembly



● Major Observations

- 1) Measured Film Resistivity for each annealing conditions : Lowest Resistivity= **$8.9 \times 10^{-4} \Omega \cdot \text{cm}$** @300°C Annealed
- 2) Measured Film Young's Modulus(E) and Yield Strength(Y) by Triboindentation from Free-standing CNT beams : Highest E=**913GPa**@300°C Annealed



● Related Publications

- 1) M.W. Jang, *et al*, Applied Physics Letter 98, 073502, 2011
- 2) M.W. Jang, *et al*, TRANSDUCERS 2011