Process Deviation Check using a Scanning Multi-Probe Nano Lithography System

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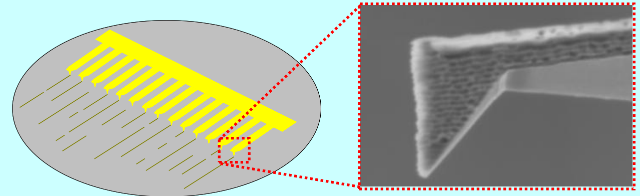
Abstract

- Evaluation of the process deviation using a multi-probe system is proposed.
- Tribological evaluation of the fabricated multi-probes is performed.

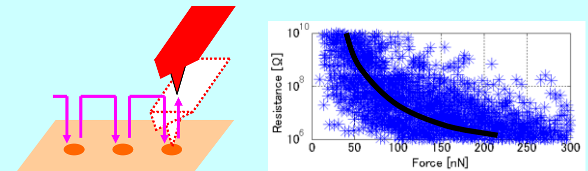
Introduction

Tribological characteristics (wear, friction, contact resistance etc.) at the nm-scale probe tip are very sensitive to the fabrication quality of the probe:
- Deviation of the contact load caused by the cantilever warp
- Peeling off of the metal electrode from the probe tip

Tribological evaluation of the multi-probe array device could be a good method to check the deviation of the fabrication processes.



Concept of the multi-probe array device with nm-scale tips

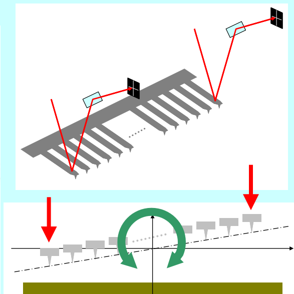


Contact load VS contact resistance at non-sliding contact mode

Methods

Scanning Multi-Probe Nano Lithography System:
- Original function: high throughput nm-scale pattern drawing by local anodic oxidation (LAO)
- Capable of measuring 20 probes' tribological characteristics simultaneously
- Tilting adjustment using the dual optical lever for parallel contact of probes and a sliding surface
- Two different modes of the electric current control (constant current mode / constant voltage mode)

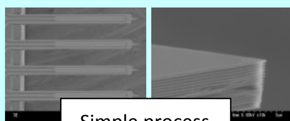
Scanning multi-prove nano lithography system

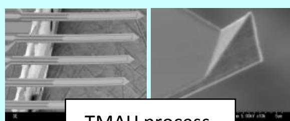


Dual optical lever for tilting adjustment

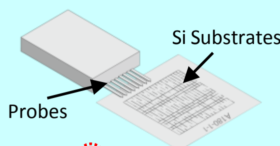
Results

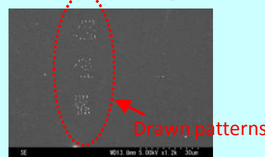
Device fabrication



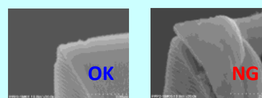


Pattern drawing by LAO

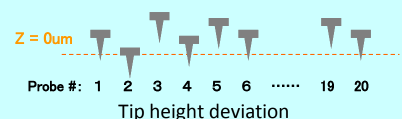




- Multi-probe devices formed by two different processes are successfully fabricated and measured.
- Relations between cantilever warp, electrode peeling off, drawn patters and contact resistance will be evaluated and discussed.



Probe tip



Tip height deviation

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NEDO