SUMMiT V design of a Micro X-Y Scanner with pseudo-AFM tip

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Outline

- Summit V Process
- TTU Module Layout
  - µAFM
    - Mechanical Design
    - Post Fabrication
    - SEM Images
SUMMiT V Process

LPCVD
PECVD
LPCVD
PECVD

0.3 μm SacOx2
0.3 μm MMpoly0

0.63 μm Thermal SiO2
0.80 μm Silicon Nitride

2.0 μm SacOx1
1.0 μm MMpoly1
1.5 μm MMpoly2
2.25 μm MMpoly3

2.0 μm SacOx4 (CMP)

2.25 μm MMpoly4

0.2 μm Dimple4 gap
0.4 μm Dimple3 gap

0.5 μm Dimple1 gap

Substrate
6 inch wafer, <100>, n-type-

** All PolySi is doped with Phosphorus **
TTU 2005 Module
- Occupies 3.47 mm²
- 19.4% of the module
- Designed to extend 110 µm in both X-Y directions with off chip access
- Cam and linkage translating 1080° of rotation to 110 µm linear motion
- Complete surface coverage up to 0.0121 mm²
- 340 µm Tip Arm
SEM of entire µAFM
Resolution Step Size

- Estimated 2.25° to 4.00° rotation per cycle
- Estimated Step resolution of 451 nm to 802 nm
μAFM

Components
- Dual Unidirectional Tensional Ratcheting actuators (TRA)
- X-Y Spiral CAM Gear and Follower
- X-Y Controller Arms
- AFM Tip and Arm
μAFM-TRA Interface Gears
μAFM-Cam System
μAFM-Arm/Cam Follower Interface
µAFM-Cam Follower Linkage
μAFM-Cam Follower Linkage
μAFM-Tip Assembly
µAFM-Tip Assembly
μAFM-Tip Assembly
μAFM-Tip Assembly
µAFM-Linkage
μAFM-Linkage
Horizontal Cam and Link
μAFM-Tip
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