

Nanotribological Characterization of Fluorocarbon Thin Film by Plasma Enhanced CVD

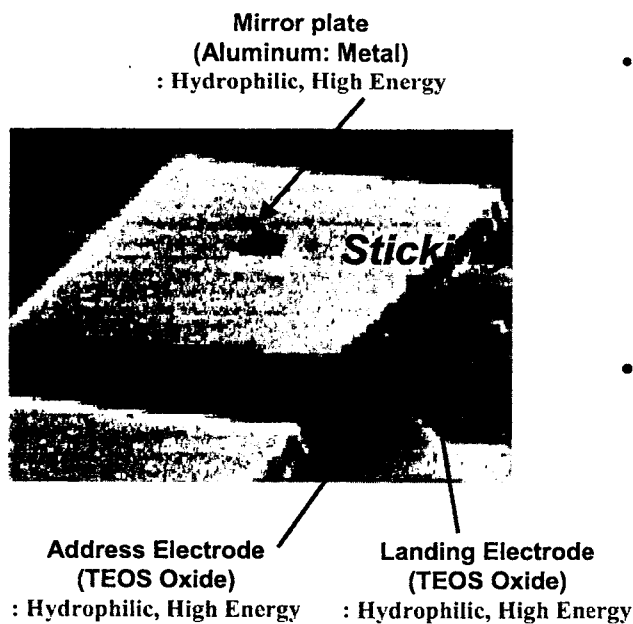
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Background



• Interaction Force

- Capillary Force (in Humidity)
- Electrostatic Force
- van der Waals Force

• Due to Sticking

- Out of order
- Problems of Yield & Reliability

Motivation

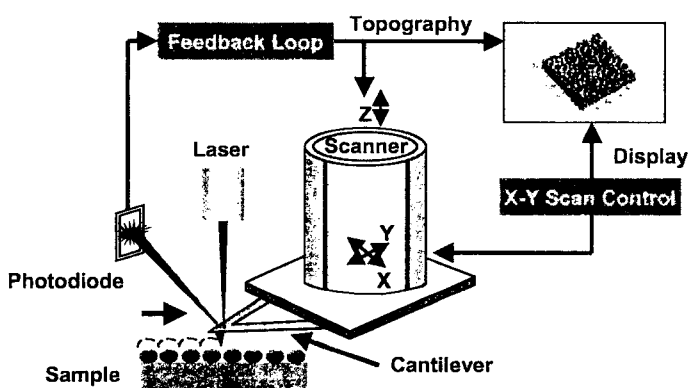
Depositing Fluorocarbon Thin Films from Plasma Enhanced CVD Method

Change Hydrophilic into Hydrophobic Surface

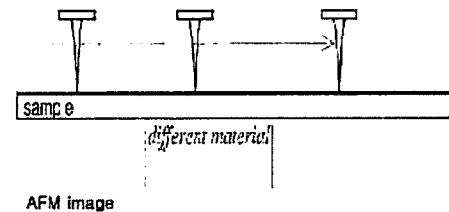
Establish Optimized Fabrication Process

Characterization of Friction Force of Fluorocarbon Thin Films by LFM

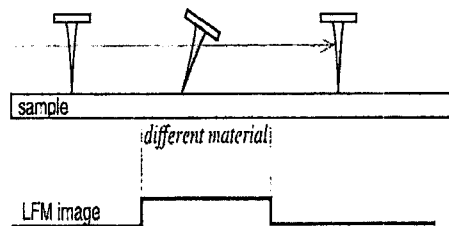
Introduction of AFM/LFM



Schematic Diagram of AFM/LFM



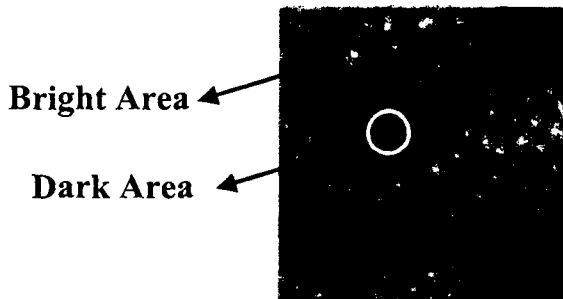
No deflection of cantilever for AFM



Lateral deflection of the cantilever from changes in surface friction

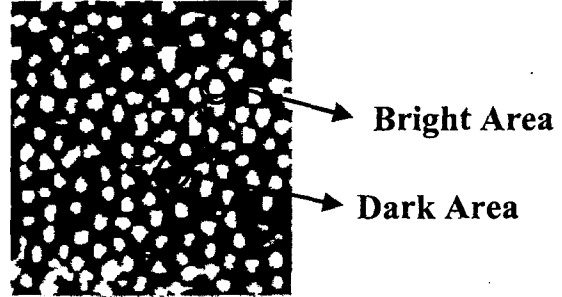
AFM / LFM Measurement

AFM



- Bright Area : High Height
- Dark Area : Low Height

LFM

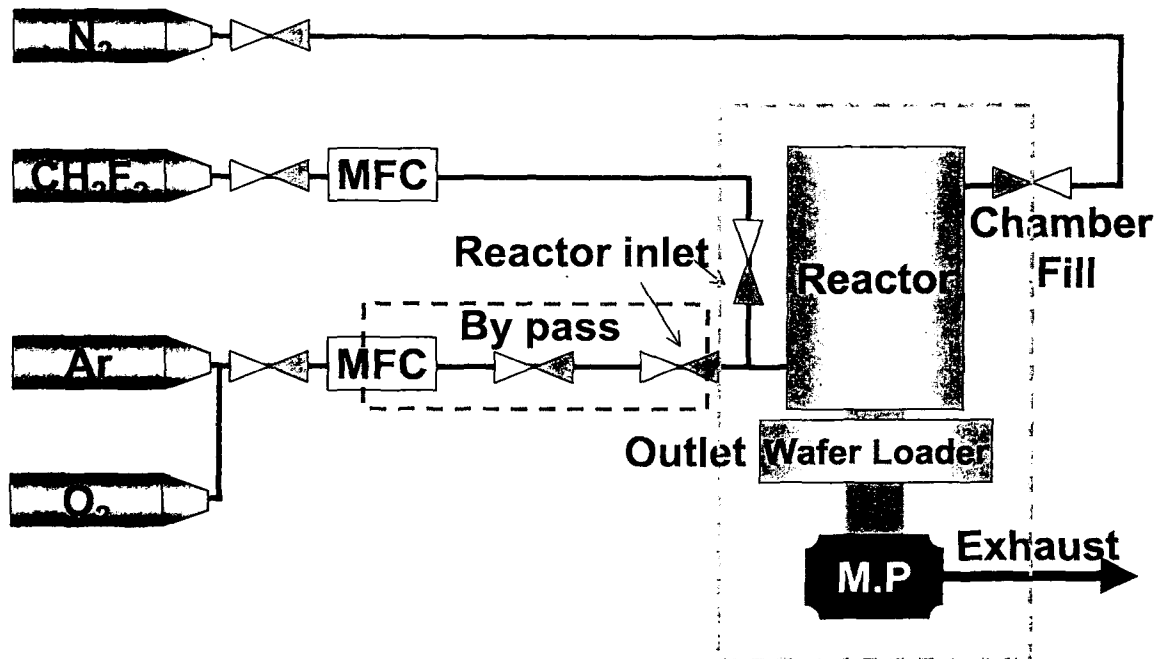


- Bright Area : High Friction
- Dark Area : Low Friction

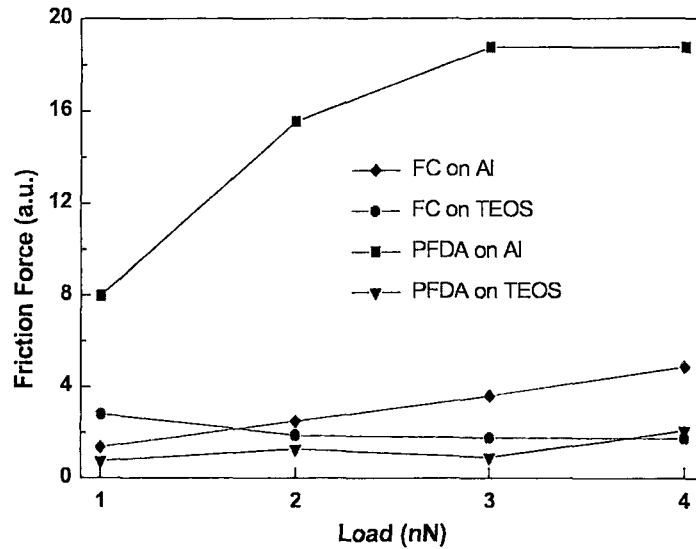
LFM(Lateral Force Microscopy)

- Useful for imaging variations in surface friction.
- Lateral force can be changed by chemical composition, viscosity and adhesion of materials.
- Friction force is not absolute value. It's relative value.

Experimental Setup

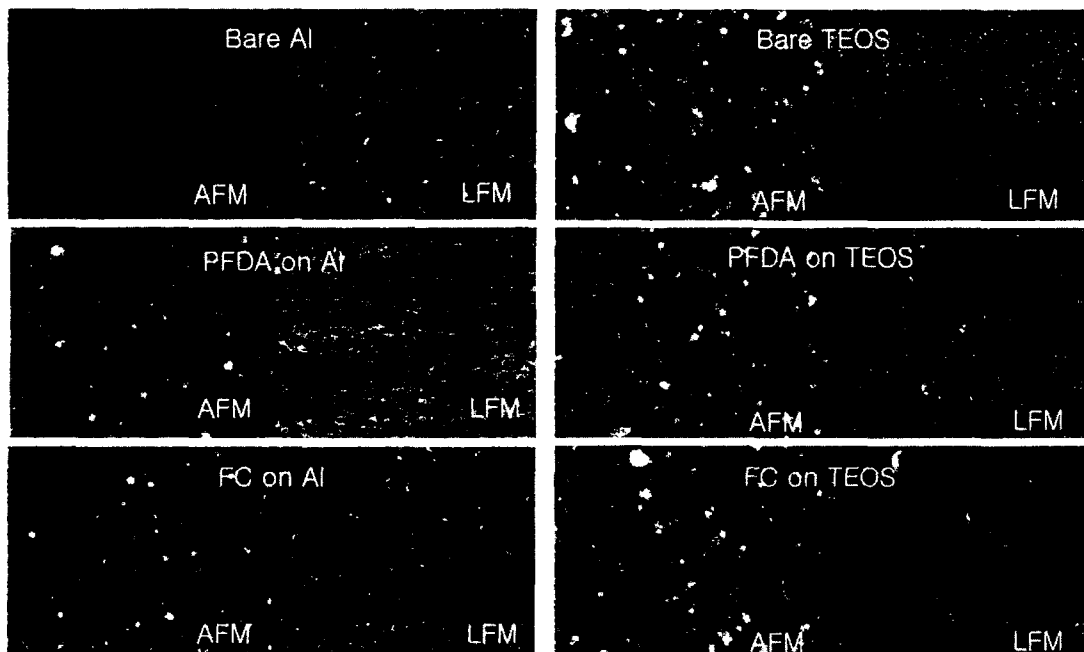


Friction Force Signal by LFM



Friction force signal on the perfluoropolymer films as a function of the externally normal force obtained by LFM

AFM / LFM Images ($5\mu\text{m} \times 5\mu\text{m}$) before and after Film Deposition on Al & TEOS



Conclusion

- *AFM/LFM* showed a *more homogeneous coverage* of films on *TEOS* than on *Al*
- *The high friction* characteristic of *PFDA film on Al* might be attributed to the *poor coverage* of the film on the surface.