



Identification and Validation of Analytical Chemistry Methods for Detecting Composite Surface Contamination and Moisture

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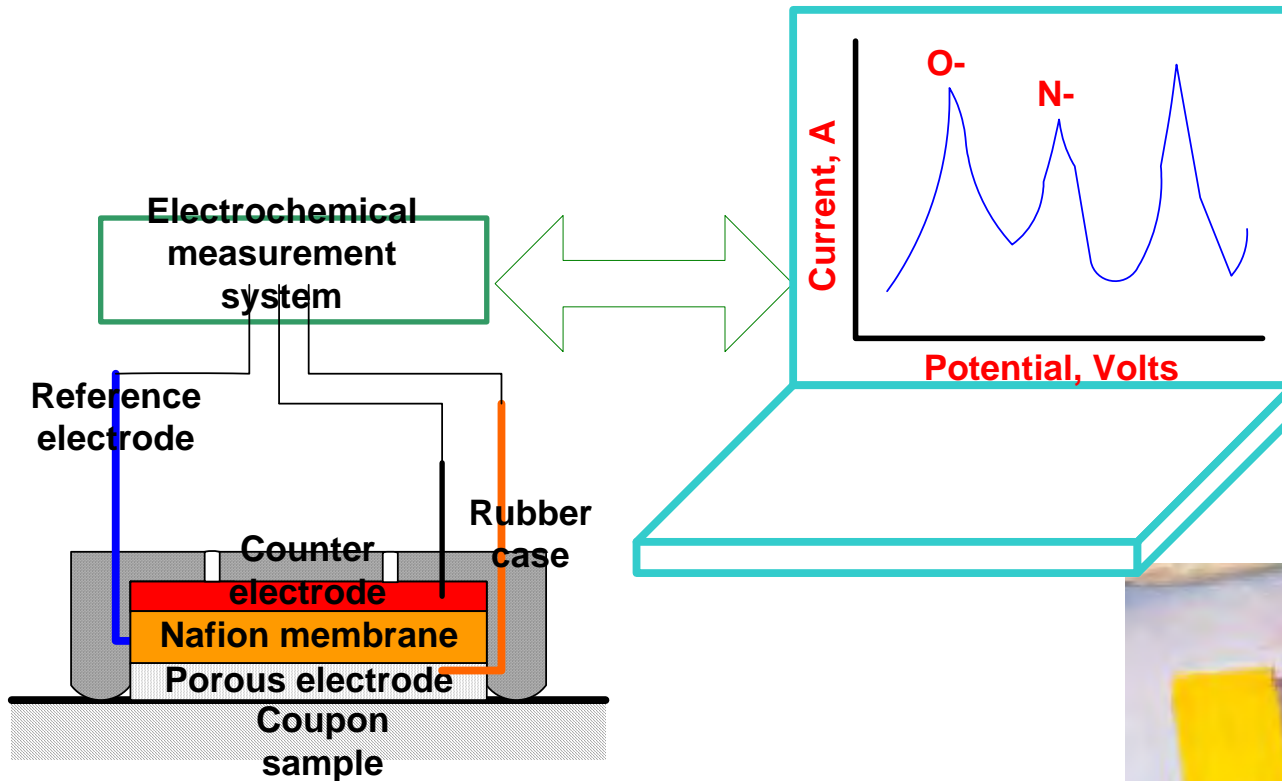
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Tasks Overview:

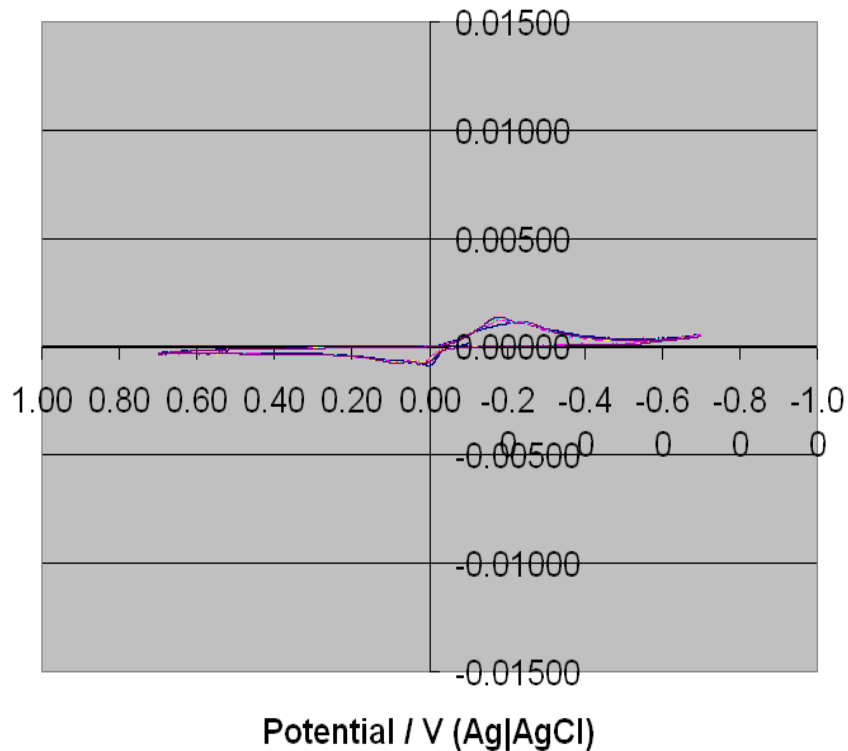
- Accomplished projects:
 - Electro-Mechanical Sensor.
 - Humidity Sensor.
 - Atomic Force Microscopy Study(AFM).
- Current tasks:
 - Refinement of Electro-Chemical Sensor.
 - Chemical Force Microscopy.
 - Correlation with other methods.

Solid-State Electrochemical Sensor

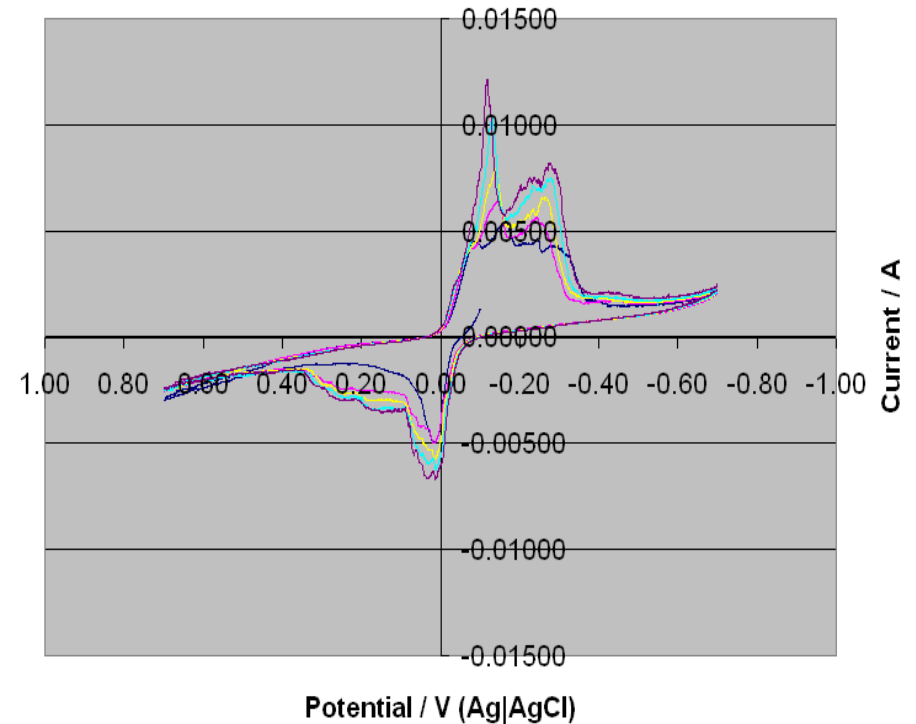


Test Results:

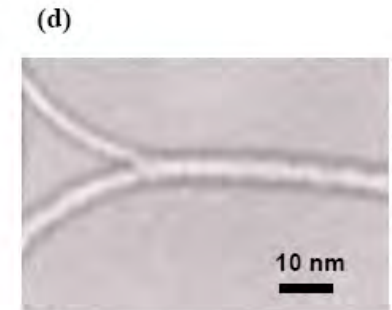
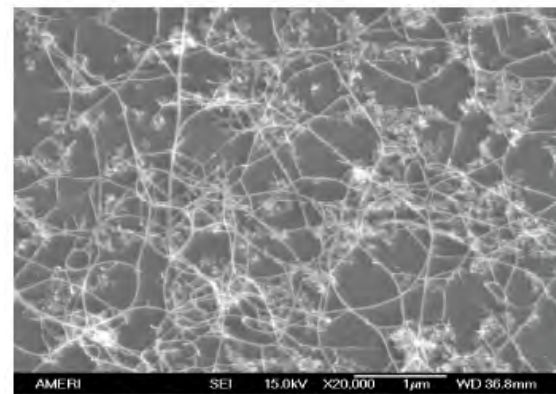
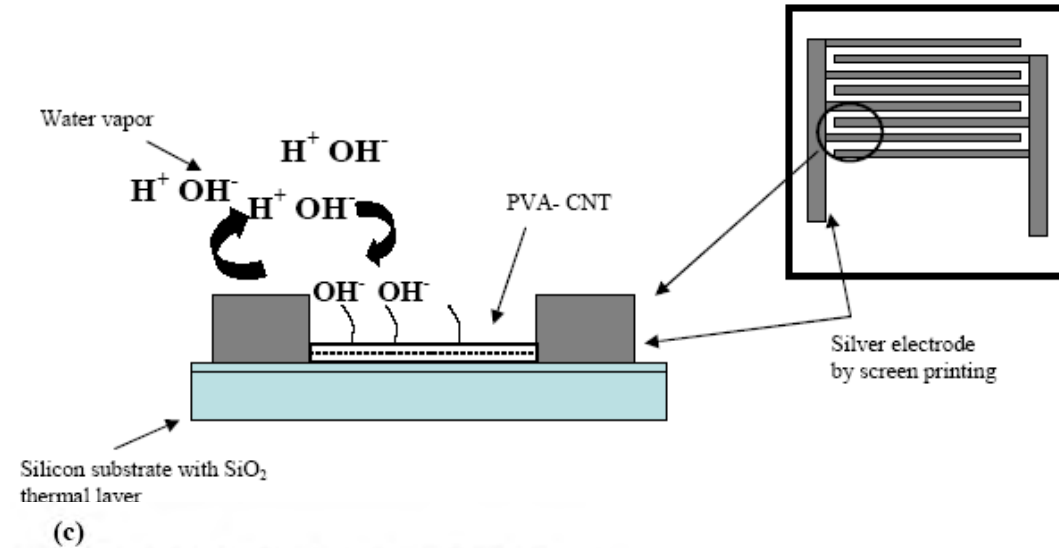
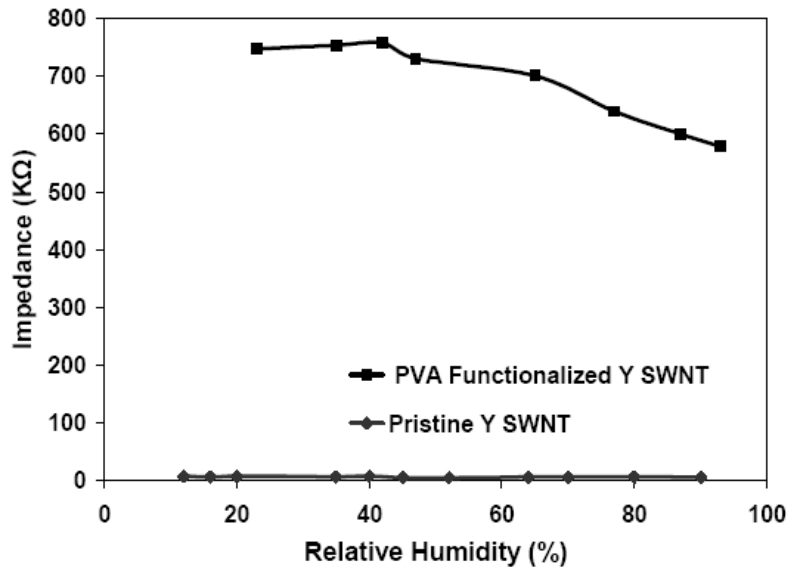
Original peel ply sample



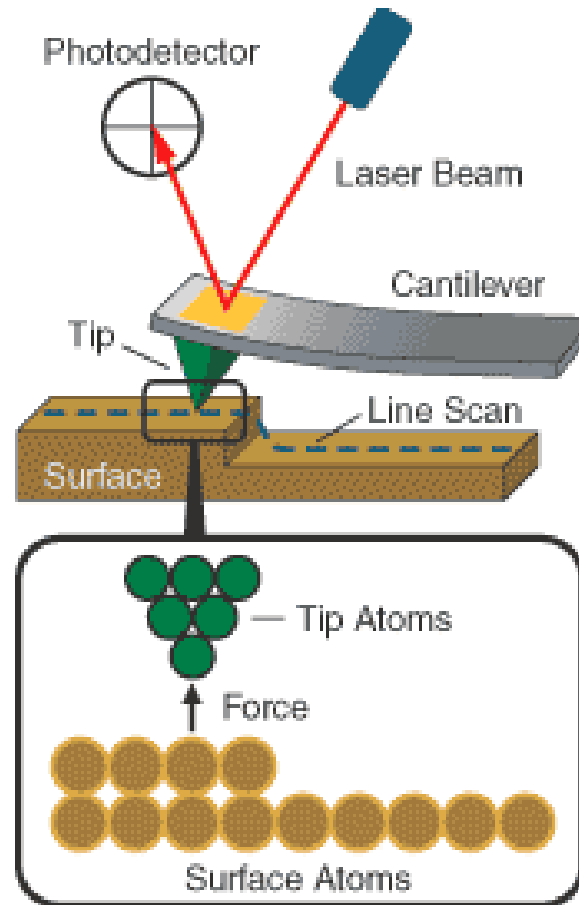
Sulfuric acid treated sample



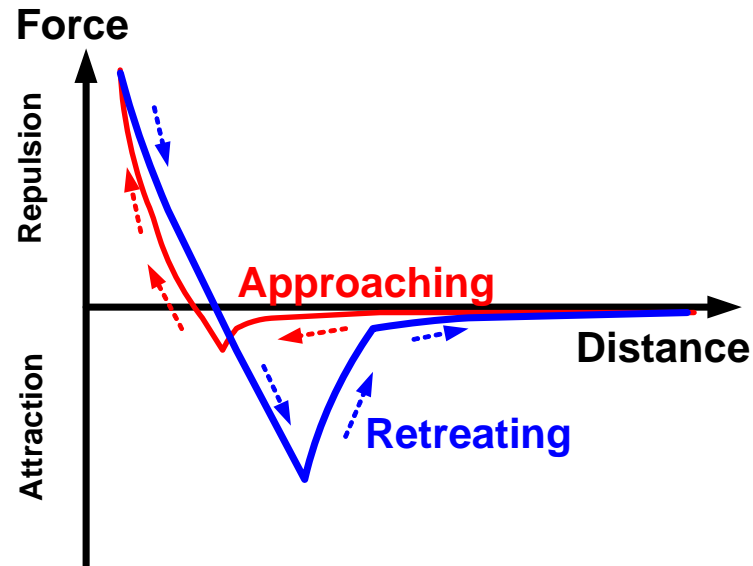
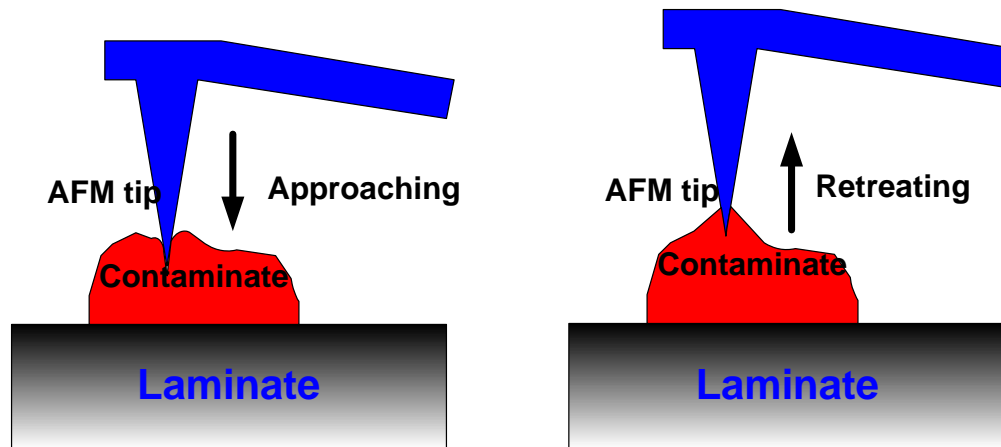
Carbon Nanotube Based Humidity Sensor



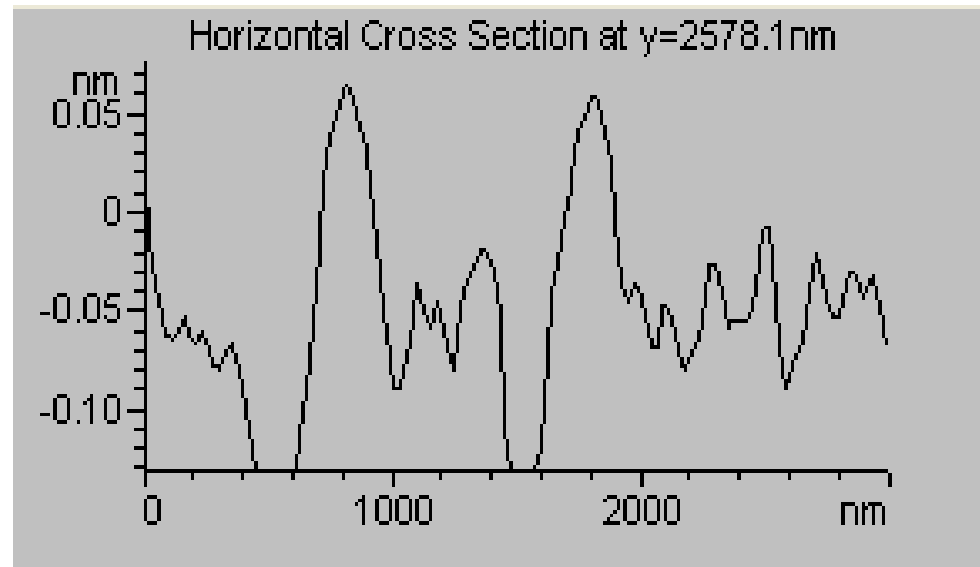
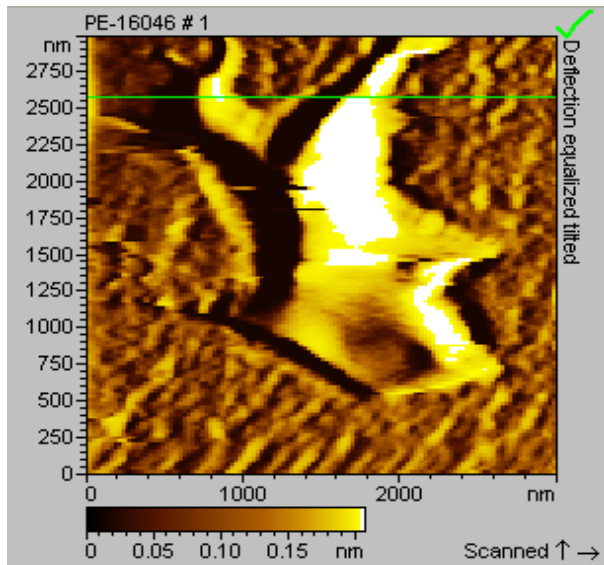
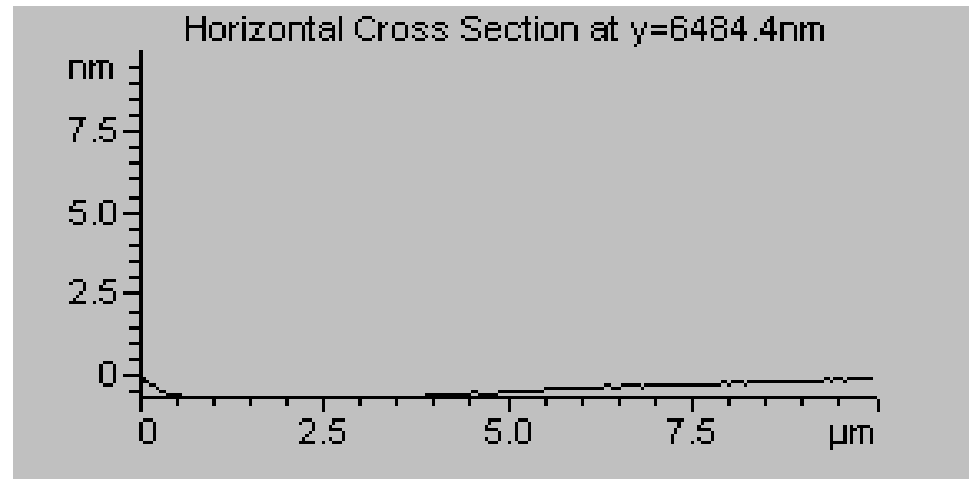
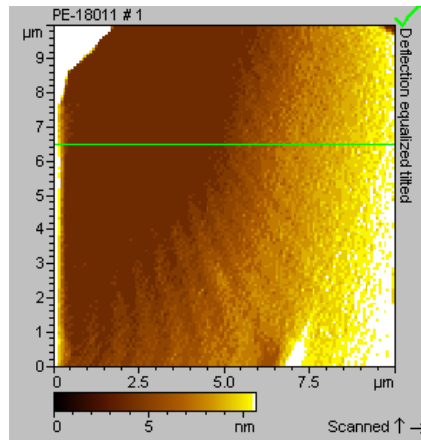
Atomic Force Microscopy (AFM) Study



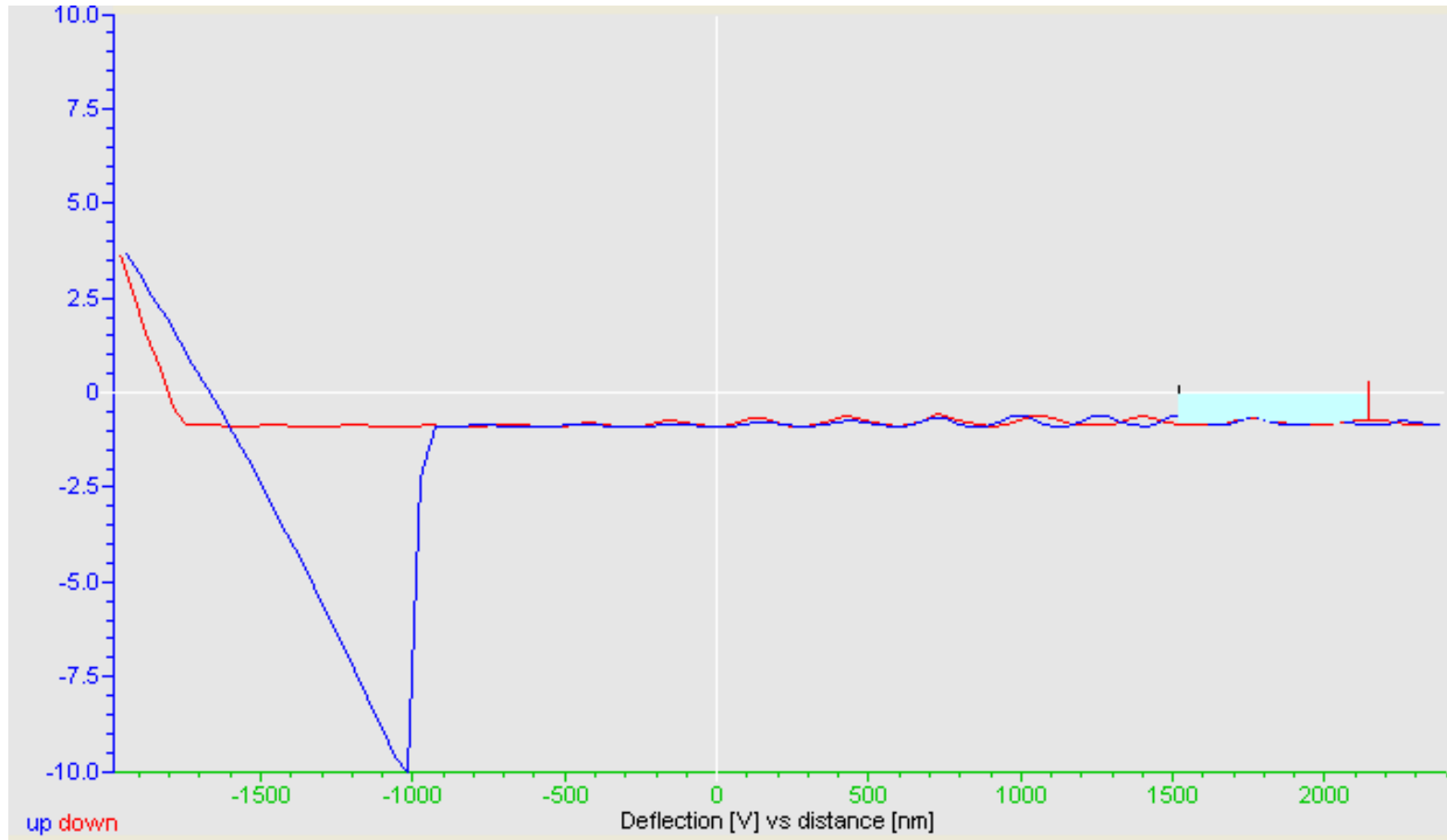
AFM Force Spectroscopy



Polyester Peel Ply Surface



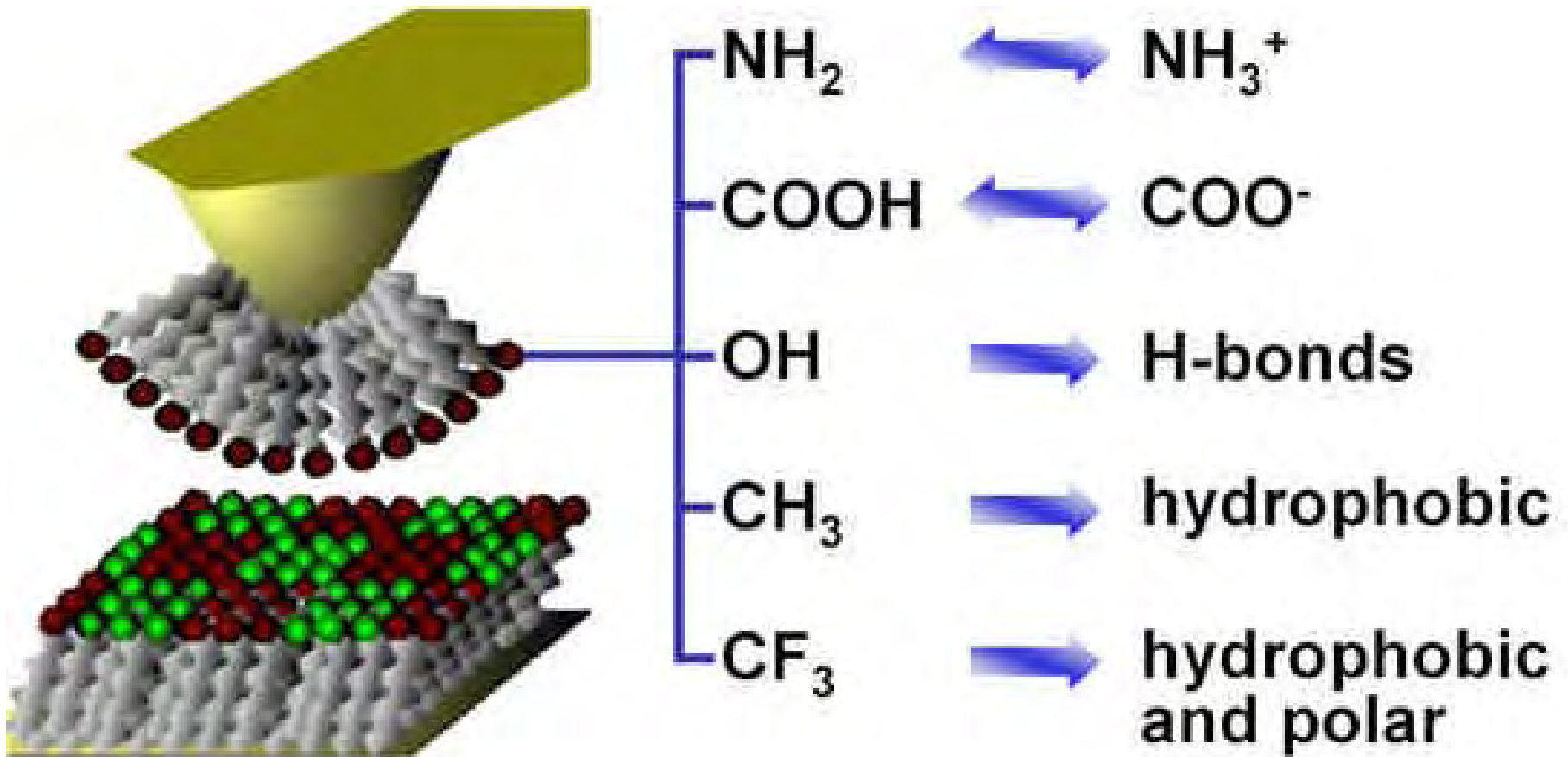
Typical Force vs. Distance For PE Peel Ply Prepared Surface



Current Tasks:

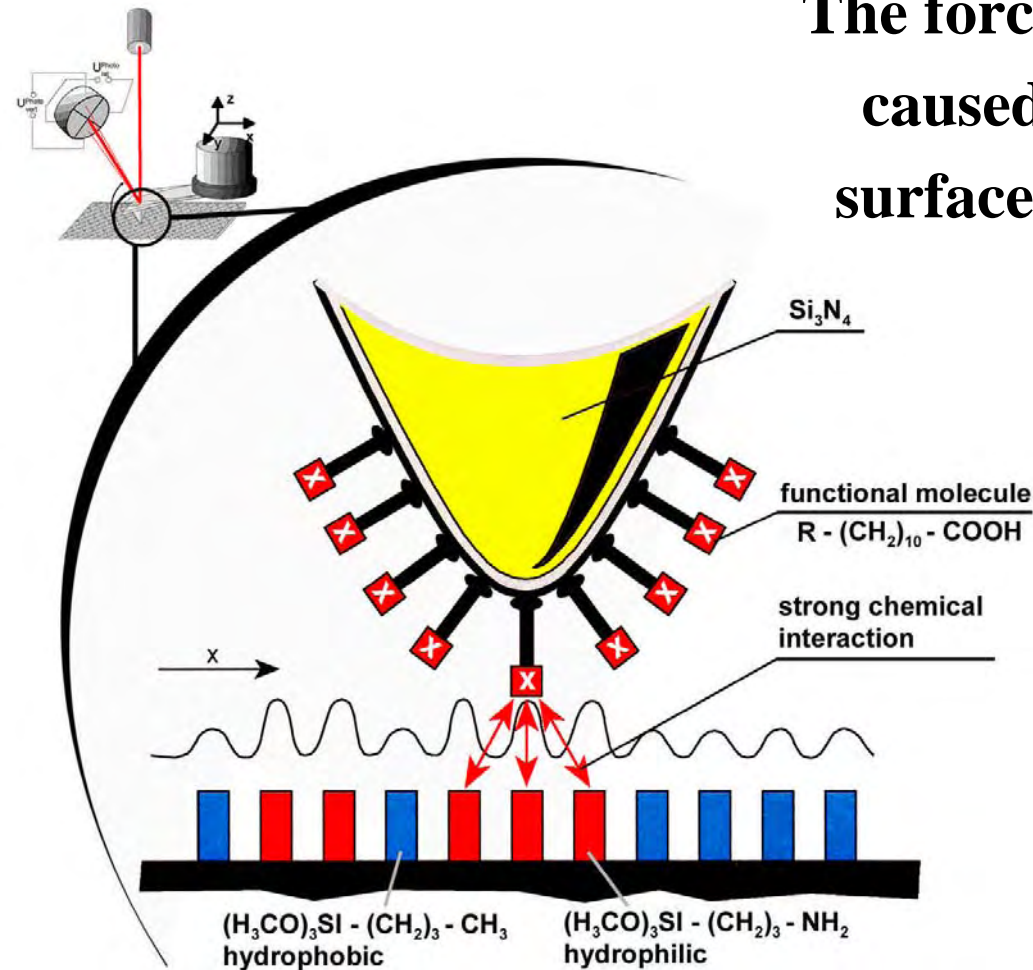
- Improvements of the Solid-State electro-mechanical sensor.
- Mapping active sites on surfaces of composites using CFM.
- Testing of the EMS and correlation of the data with other studies using AFM, CFM, X-ray photo spectroscopy.

Chemical Force Microscopy



Chemical Force Microscopy

The force is increased by the locally
caused chemical reaction to the
surface by a chemical component



A Look Forward

- Benefit to Aviation
 - Better understanding of the pre-bond surface preparation methods
 - Better understanding of bond strength and durability versus surface preparation
 - Novel in-field, online certification and assurance technology for surface preparation
 - Reduced costs for surface preparation and adhesive bonding processes
- Future needs
 - In-field, online analytical detection and monitoring technologies for manufacture, chemical, environmental, and energy industries.

Thank you!