Combinatorial spectroscopic ellipsometry and quartz crystal microbalance with dissipation to study organic ultra-thin film evolution

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**Our Message**

- Ultra-thin (≤ 10 nm) organic thin film attachment was studied with combinatorial spectroscopic ellipsometry (SE) and quartz crystal microbalance with dissipation (QCM-D).
- The dynamic porosity of a self-assembled monolayer (SAM) was found, and the surface chemistry of the layer was verified by contact angle measurement.
- We report a preliminary study for biosensor applications, by SE/QCM-D. Selective hybridization of a target molecule to an aptamer probe was observed by SE.

**Self-Assembled Monolayer (SAM) Chemisorption**

2 mM 8-mercapto-1-octanol in water

**Selctively Detecting Genes that Increase the Risk of Prostate or Pancreatic Cancer**

**Experimental Setup**

**Measurement and Analysis Scheme**

- **Assumptions:**
  - Adhesive index of refraction
  - Adhesive volume fraction
  - Adhesive density
  - Adhesive thickness
  - Total film density
  - SE thickness
  - Overtone N
  - QCM-D thickness
  - Overtone N
  - QCM-D surface density
  - Adhesive mass fraction
  - Dipolar

- **Time (min)**
- **Thickness (nm)**
- **Probe Chemisorption in Physiological Buffer**
- Uniform \( t \) reflects simple kinetics and homogenous structure
- Pressure perturbations: flow control important
- **Selectire Gene Hybridization in Physiological Buffer**
- SE sensitive to sub-angstrom average layer thickness changes

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