LITJ102: 157 nm Resist and Process Research

Grant Willson
The University of Texas at Austin
Resist Advisory Group Meeting
September 12, 2001
Acknowledgements

- SEMATECH
- Clariant
- JSR
- Central Glass
- The Students!
Resist and Process Development

Basic Chemistry

Formulation and Process Development

Optimization

Performance

Time

70nm

157 nm

248nm

193nm

We are off the base line

I-line
Where are we now???

- The issue continues to be….absorbance.
  - Great progress
    - One million fold improvement since $t = 0$
  - But, “a bit” more improvement needed
    - Now at $A \approx 1.5 \mu^{-1}$, need $A \approx 0.5 \mu^{-1}$
  - But it gets more and more difficult to improve…

![Graph showing absorbance over time]
Be Skeptical of Absorbance Data

- All of the numbers you see are worse than the intrinsic characteristic of the material
  - The polymers are dirty
    - They contain solvent, dirt, impurities
    - Adsorbed organics, bases (t-top!), water, etc.
    - Some of these impurities absorb very strongly
  - Note how materials improve over time….
  - Best data is from gas phase measurements
Technology Transfer

- Monomers are being made in thousands of pound batches!
- Back fill to 193nm formulations to improve transparency??
- First formulations are being scaled up by resist vendors and their suppliers!
Presentations

1. SEMATECH
   - Will Conley

2. Clemson
   - Brian Thomas - C₂F₄

3. Cornell
   - V. Vora - Acrylate Platforms

4. Berkeley
   - Nick Benzal - Mass Persistence

5. The University of Texas
   - Brian Osborn – ROMP and Metal catalyzed addition polymers
   - Charles Chambers – Free radical polymerization
   - Brian Trinque – Acrylate copolymer based resists
   - Takashi Chiba – CO co-polymers and dissolution inhibitors
   - Will Conley – Process studies

6. Summary and Questions