Summary

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IEUVI Resist TWG

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ASML – Noreen Harned

- Proposed change for traditional CAR to cleanable or non-cleanable resist outgassing specification since additional data available and to avoid hindering resist development
- New materials will require composition information and can get waiver for limited number of wafers
- Propose hydrogen plus electron for chemistry, ellipsometry for film thickness loss (HCS with bias or electron gun?)

EIDEC– Shiobara-san

- **Four sites tested for wafer temperature during resist exposure, one near 22C, others in 28-32 range, this could account for some of the different results between sites for round robin testing**
- **Showed area/pumping speed ratio gives similar results, so should be basis for calibration between tools**

IMEC– Roel Gronheid

- **Good linear correlation between electron and EUV exposures in the same tool**
- **Have tested non-CAR materials, no non-cleanable contaminaton on witness plate even from metal containing resists**
- Considering work with hydrogen environment

NIST outgas testing update – Bobby Berg

- **Increased temperature in tool, reduced pumping speed, and changed to silicon filter for more transmission including longer wavelengths**
- **Showed correlation between 100-300 AMU integrated outgassing signal with carbon thickness meausurement**

NIST– Shannon Hill

- **Witness sample roughness doesn't affect contamination growth, but it affects the ability of ellipsometry to measure the growth**
  - Linear decreasing trend of higher witness plate roughness and lower CG measurement from ellipsometry
  - XPS showed carbon was present, just missed in the measurement of a rough surface by ellipsometry

SEMATECH – Yu-Jen Fan

- **221 samples tested in 2014, 98% pass cleanables, all pass non-cleanable**
- Continued to verify family testing in collaboration with JSR
- **Multiple non-CAR tested, and all passed both cleanable and non-cleanable. No metal found in XPS**

Nissan – Shibayama-san

- **Demonstrated dry development process with silicon containing layer and tone reversal by etch of photoresist**
- Showed 14 nm HP with ~ 40 nm deep layer

Merck - Tarutani-san

- **Demonstrated edge roughness control by additive liquid coating then baking to thermally flow the near surface of resist to remove roughness**
- Puddle time didn’t affect results, so ERC agents must penetrate resist surface quickly
- Bake temp of 130 caused CD shift, so might be bulk thermal flow of resist
- Treatment helped the high frequency LER, but the low frequency is likely caused by low dose statistics and can’t be solved with treatment

Rutgers Univ. - Bartynski

- **Demonstrated both first principles modeling and REELS measurements of polymers for resist and results agree indicating the measured peaks can be understood and identified**
- **Excitation peaks have cross section that varies with electron energy**

SUNY PI – Denbeaux

- **Showed results of PAG reactivity to low energy electrons, similar to primary electrons generated by EUV photoabsorption, with 2x difference in efficiency depending on the PAG choice**

THANK YOU

SEE YOU NEXT TIME