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International Symposium Identifies Top Issues for sub-40 nm Immersion Litho

October 17 2006

Bolstered by evidence that 193 nm immersion (193i) lithography is here to stay, semiconductor technology leaders have identified the top five critical issues for extending the breakthrough imaging process toward the 32 nm technology generation.

Meeting here recently at the 3rd International Symposium on Immersion Lithography—sponsored by Selete and SEMATECH in cooperation with IMEC—nearly 400 technologists heard presentations showing that 193i is on track for volume manufacturing at sub-65 nm half-pitch, and might be extensible below 40 nm half-pitch with techniques using high refractive index fluids and very high numerical aperture (NA).

In response, the Symposium's steering committee established the following key challenges for utilizing 193i below 40 nm half-pitch:

1. Development of high-index lens materials
2. Identification of high-index refractive fluids
3. Availability of effective photoresists (including leaching & high index resists)
4. Cost-effective development of double exposure patterning
5. Attainment of low defectivity

"A path forward to half-pitch imaging below 40 nm has been clearly identified—but our ability to get there will depend on how much progress we make in solving these critical issues," said Michael Lercel, SEMATECH's Lithography director. "We'll need to make strategic

decisions on high-index materials, double patterning and double exposure to understand the ultimate extensibility of the technology into high-volume manufacturing."

Key presentations during the Symposium focused on hyper-NA, resists, exposure tools, optical materials, process, photomasks, immersion defects, and alternative immersion fluids. More than 20 percent of submitted papers dealt with immersion defects, revealing the industry's momentum in preparing 193i for volume manufacturing at sub-65 nm half-pitch. Interest in extending the technology below 40 nm half-pitch was demonstrated by a comparable number of submissions on high-index fluids. Also, many participants appeared convinced that 193i technology could reach and possibly exceed 1.55 NA.

The Symposium was organized by Selete and SEMATECH in cooperation with IMEC. SEMATECH will organize a fourth international Symposium, aimed at accelerating decisions related to the identified critical issues, in October 2007 in the United States.

Citation: International Symposium Identifies Top Issues for sub-40 nm Immersion Litho (2006, October 17) retrieved 18 April 2024 from https://phys.org/news/2006-10-international-symposium-issues-sub-nm.html

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