SEMATECH and Exitech to Develop the World's First Ultra High Numerical Aperture 193 nm Immersion Lithography Tool

July 7 2004

Austin, Texas and Oxford, England (7 July 2004) -- International SEMATECH and Exitech have announced an agreement to develop **the world's first ultra high numerical aperture (NA = 1.3) 193 nm wavelength immersion lithography tool**. This groundbreaking microexposure tool, the MS 193i, will help speed the development of critical infrastructure for immersion lithography at SEMATECH's Immersion Technology Center in Austin, Texas.

"We're pleased to continue our history of providing the first imaging tools for companies to use in developing and enhancing their resist formulations, evaluating performance capabilities, and gaining experience in tool operation," said Giang Dao, SEMATECH's Director of Lithography. "With the capability provided by the MS-193i, SEMATECH will drive the development of photoresists, immersion fluids, and other key infrastructure components for high NA 193 nm immersion lithography."

In immersion lithography, a liquid is interposed between an exposure tool's projection lens and the wafer. Immersion technology offers the opportunity for better resolution over conventional projection lithography because the lens can be designed with a NA greater than one, thus creating the ability to produce smaller features. A particular advantage of using immersion lithography at the 193 nm wavelength is that much of the "dry" 193 nm lithography infrastructure (laser sources,

reticles, tool architecture, etc.) can be incorporated with minimal enhancements, while water – in its deionized, degassed, purified and filtered form – can be used as the immersion liquid.

Early work in immersion lithography was conducted in the 1980s, but it remained essentially a curiosity until very recently. Beginning in 2002, SEMATECH began to organize and lead industry efforts to identify and resolve the critical issues in order to realize the potential of immersion lithography. Since then, the industry's interest in 193 nm immersion lithography has grown rapidly.

"Largely stimulated by the efforts of SEMATECH, the rapid developments made by exposure tool manufacturers and researchers over the past year now appear to make 193 nm immersion lithography the preferred technology for manufacturing at the 65 nm node," said Malcolm Gower, Chairman and Technical Director of Exitech. "Depending on many developments, including tailoring new immersion fluids with refractive indices higher than water, this technology may be extendable to additional technology nodes."

The Exitech MS-193i tool, due to be installed at SEMATECH during the third quarter of 2005, incorporates a 1.3 NA catadioptric, 0.4 mm field, water immersion imaging objective lens developed by Corning Tropel (Fairport, NY). With a 4k Hz, linearly polarized, 193 nm natural bandwidth ArF laser source from Lambda Physik (Göttingen, Germany), the tool is expected to image minimum feature sizes of 70 nm and 45 nm respectively using binary and phase shifting masks.

In addition to being used for testing immersion resists at the feature sizes eventually needed in production, the MS-193i will also enable early learning on how polarization, illumination geometries, reticle architectures, and fluid defect printability affect imaging in resists with hyper-NA immersion lenses. The tool is also designed to be upgradeable

to allow incorporation of even higher NA immersion lenses as advances occur in higher refractive index fluids, lens designs and illumination configurations.

The original press release can be found here.

Citation: SEMATECH and Exitech to Develop the World's First Ultra High Numerical Aperture 193 nm Immersion Lithography Tool (2004, July 7) retrieved 25 April 2024 from https://phys.org/news/2004-07-sematech-exitech-worlds-ultra-high.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.