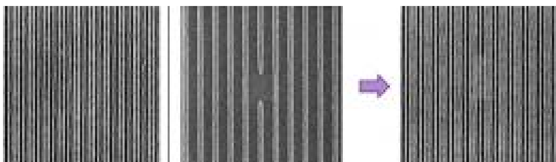
World's first 300mm-fab compatible directed self-assembly process line

February 10 2012



14nm polystyrene lines on 28nm pitch after PMMA removal fabricated by DSA using 193nm immersion based 84nm pitch pre-pattern (left) and demonstration of the ability to repair a 200nm gap in the pre-pattern (right).

At next week's SPIE Advanced Lithography conference (San Jose, CA), imec announces the successful implementation of the world first 300mm fab-compatible Directed Self-Assembly (DSA) process line all-under-one-roof in imec's 300mm cleanroom fab. The upgrade of an academic lab-scale DSA process flow to a fab-compatible flow was realized in collaboration with the University of Wisconsin, AZ Electronic Materials and Tokyo Electron Ltd. Imec's DSA collaboration aims to address the critical hurdles to take DSA from the academic lab-scale environment into high-volume manufacturing.

Directed Self-Assembly (DSA) is gaining momentum as a means for extending optical lithography beyond its current limits. DSA is an alternative patterning technology that enables frequency multiplication through the use of block copolymers. When used in conjunction with an appropriate pre-pattern that directs the orientation for patterning, DSA

can reduce the pitch of the final printed structure. Moreover, DSA can be used to repair defects and repair uniformity in the original print. This repair feature is especially useful in combination with EUV lithography, which today is characterized by local variation in the CD (critical dimension), especially in case of small contacts.

Imec now has the complete toolset on-site including a dedicated and specially configured DSA coater/developer manufactured by TEL with installed DSA materials in gallon-size quantities, the metrology toolkit including DSA defect inspection, and in-house pattern transfer capabilities all in a representative 300mm cleanroom fab environment. With established 248nm, 193nm (dry and immersion) and EUV lithography tool sets on site, imec is uniquely positioned to study DSA defectivity aiming at increasing the pattern reliability of DSA for semiconductor fab standards. Moreover, imec aims at further developing the possibilities of DSA repair in combination with EUV lithography, pushing imec's ambition to bring EUV Lithography to production level.

Kurt Ronse, Director Lithography Department at imec: We are excited with this achievement, as this enables us to expand the scope of our research offering and toolset bringing more value to our partners. The availability of a DSA processing line enables us to further push the limits of 193nm immersion lithography and overcome some of the critical concerns for EUV lithography. This allows us to further push the limits of Moore's law."

"With this process, imec has taken an important step towards fulfilling the low cost, high resolution promise of bottom up DSA lithography," says Ralph Dammel, CTO of AZ Electronic Materials. "We are committed to providing the high performance materials the industry needs to make DSA a commercial reality."

Prof. Paul Nealey: "Juan de Pablo and I and the University of Wisconsin

team are very pleased to have the opportunity to partner with imec. Our work together results in unprecedented integration of DSA with manufacturing-ready tools and materials, allows investigation of the ultimate potential and possible limits of DSA not possible in an academic setting, and provides exceptional educational opportunities for our students. We are gratified to be on a pathway with imec towards commercialization of technology we have spent almost 15 years developing."

This research offering is part of imec's Advanced lithography program, available to imec's partners in its core CMOS programs. Imec's key core CMOS partners are Globalfoundries, INTEL, Micron, Panasonic, Samsung, TSMC, Elpida, Hynix, Fujitsu and Sony.

Provided by IMEC

Citation: World's first 300mm-fab compatible directed self-assembly process line (2012, February 10) retrieved 24 April 2024 from https://phys.org/news/2012-02-world-300mm-fab-compatible-self-assembly-line.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.