EXCITE

Status update EXCITE T406, the MEDEA+ Extreme UV Consortium for Imaging Technology

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Project Partners

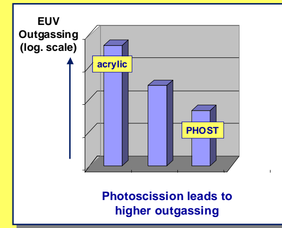
Abstract

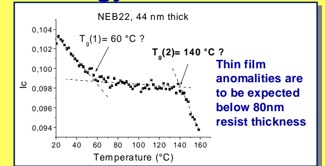
Last year, a new European initiative on EUV lithography was started through MEDEA+, named EXCITE T406 (Extreme UV Consortium for Imaging Technology). The project consortium consists of four IC makers (Freescale, Infineon, Philips and STMicroelectronics), a group of equipment and materials companies (ASML, Carl Zeiss, Clariant, ELDIM, LPICM, and SAGEM) and six institutes (CEA-Leti, Elettra, IMEC, LTM-CNRS, Paul Scherrer Institute and TASC-INFM).

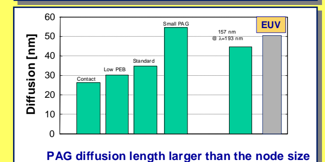
The EXCITE project aims at addressing **EUV imaging roadblocks** for the 45nm technology node and beyond. The project accommodates individual pieces of EUV lithography through separate Work Packages (i.e. Resist, Mask, Modeling, and Metrology) utilizing available EUV Litho Cells, to enable 45nm technology node patterning development on a full-field ASML alpha-tool by year-end 2005. The project has close links to other European EUV projects, of which EXTATIC and EXTUMASK, developing the ASML alpha-tool and EUV mask infrastructure, respectively, are the two most important.

EUV Resist Technology

A variety of resist platforms was screened on open frame and interferometer tools, and on 0.1 NA microsteppers. New issues reported:







EUV Mask Technology

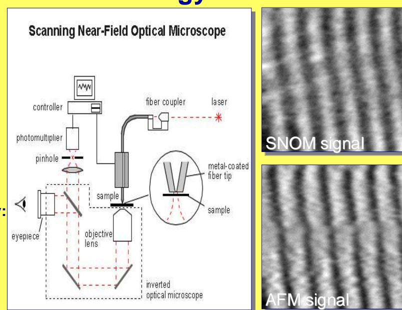
Shadowing effects

Effect of mask imperfections on imaging:

Inspection by X-ray microscopy

Characterization of programmed defects already characterized with dark/bright field microscopy:
- SNOM/AFM
- high resolution SEM
- TEM

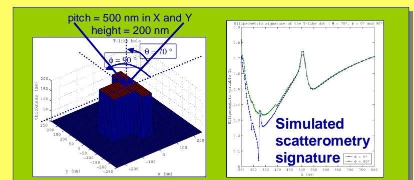
Acceleration damage tests

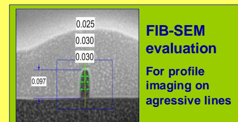


SNOM pictures from M. Lazzarino and B. Ressel of INFM-TASC
CEA-LETI sample; step height 19.4nm grating period 3µm

Metrology

Four topics for litho process :
- **Ultimate CD metrology for line**
- **Profile metrology**
- **Metrology of 2D patterns**
- **Overlay metrology**





FIB-SEM evaluation

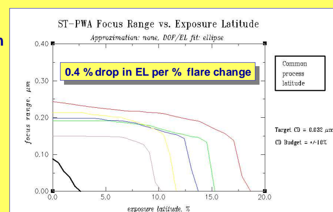
For profile imaging on agressive lines

- Diffraction-based methods integration attempt
  - Feasibility demonstrated on resist test wafers
  - Integration test on a active/gate short loop
- Same performance between integration and feasibility : around 5 nm actual overlay accuracy

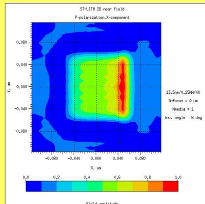
Modelling

EUV flare reduces process windows

Flare variation across chip may lead to CD variation across field of 4 nm to 7 nm (@ 32nm)

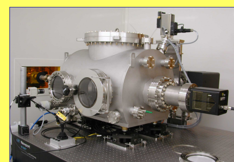


First 3D EUV mask simulation was demonstrated



3D Simulation of Contact 30nm on 60nm pitch Near Field

EUV Litho Cells



Interferometer @ PSI

"BEL"
Banc d'Essai Lithographie EUV
0.32NA tool @ CEA-Leti

Summary and Conclusions

The EXCITE T406 project has already proven its success in the assessment of EUVL roadblocks at the (sub-)45nm technology node. The diversity in partner backgrounds has enabled a research approach from various viewpoints. The collective knowledge obtained through this project will drive process development on full-field tools from 2006 onwards.

Acknowledgements

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