CNSE ROX Outgassing Tool

ASML certification, throughput, and plans

10/20/11

IEUVI Resist TWG, Miami

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Started from existing Resist Outgassing and eXposure (ROX) Tool

Zr Filter

Energetiq Source

300 mm wafer Load Lock

Photodiode

Mass spectrometer

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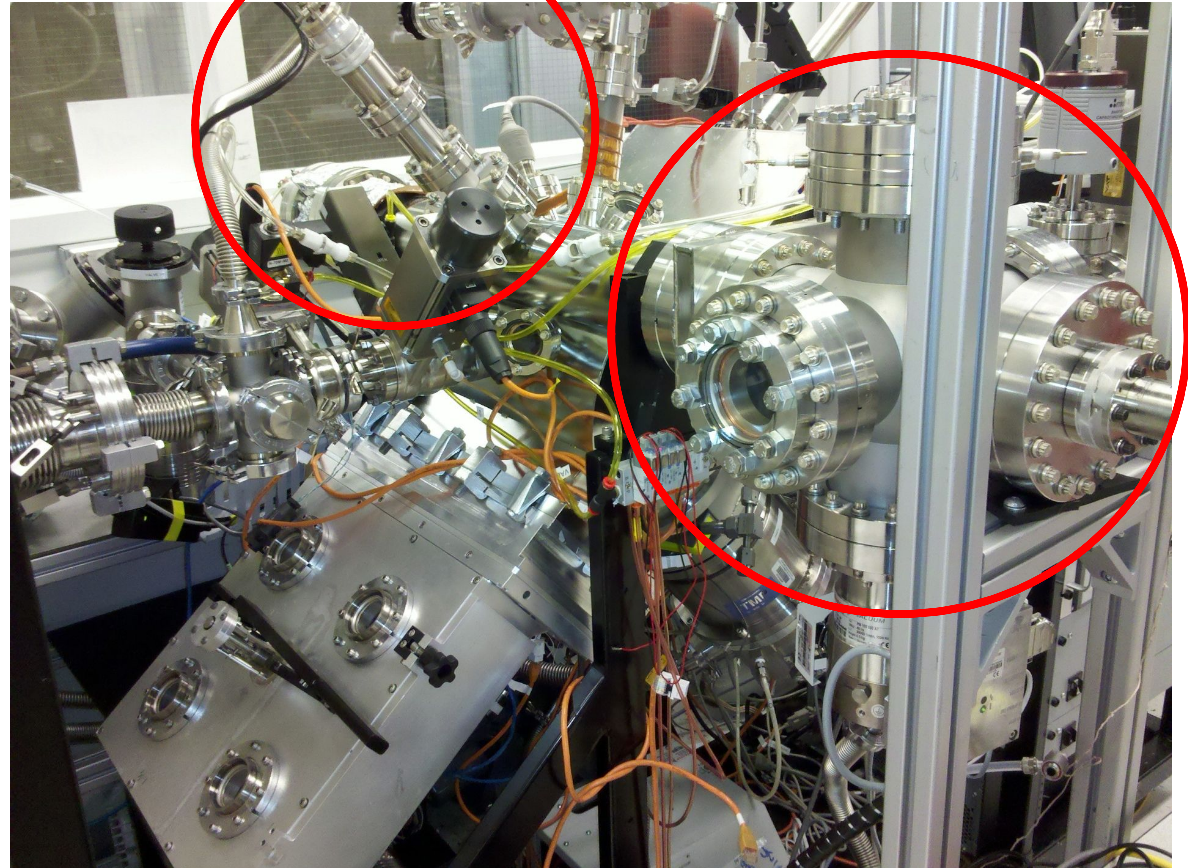
Worked toward ASML requirements

- Installed and aligned electron gun
- Realigned electron gun…
- Added witness plate loadlock transfer system
- Added witness plate cleaning
- Plasma cleaned chamber
- Obtained <u>shared</u> access to XPS
- Obtained <u>shared</u> access to ellipsometry
- Upgraded system components
- Optimized control system



Hybrid system – EUV exposures of resist and electron exposures of witness plate

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Passed the ASML requirements

Data package check list for tester qualification

Data package		Data description
1 Facilities	a	Specification resist processing (uniformity and repro)
	b	Specification ellipsometer
	c	Ellipsometry C or SiO2 on Si sample (fixed thickness cross ref)
	d	Ellipsometry Si/Ru/C peak sample
	e	Specification XPS
	f	XPS Si / Ru / cleaned contamination ASML refence sample
2 Vacuum	a	RGA spectrum of ultra clean vacuum with pressure reading
	b	Pumping speed data of calibration mixture
Functionality	a	Witness sample e-beam stability data
	b	Wafer e-beam or photon stability data
3 Cleaning	a	Cleaning process conditions
	b	Sample temperature profile as a results of duty cycle
	c	Cleaning background contribution
4 Qualification tests	a	Contrast curve of specified resist to determine D2C
	b	D2C exposure W2W reproducibility
	c	D2C exposure within wafer uniformity
	d	Exposed area and test timing contamination growth test
	e	Reproducibilty of contamination growth exposure
	f	Contamination grown from background (total thickness)
	g	Contamination grown from background (content)
5 Calibration	a	Check outgassing limited contamination growth regime
	b	Calibration exposures (3 - 4 resists)

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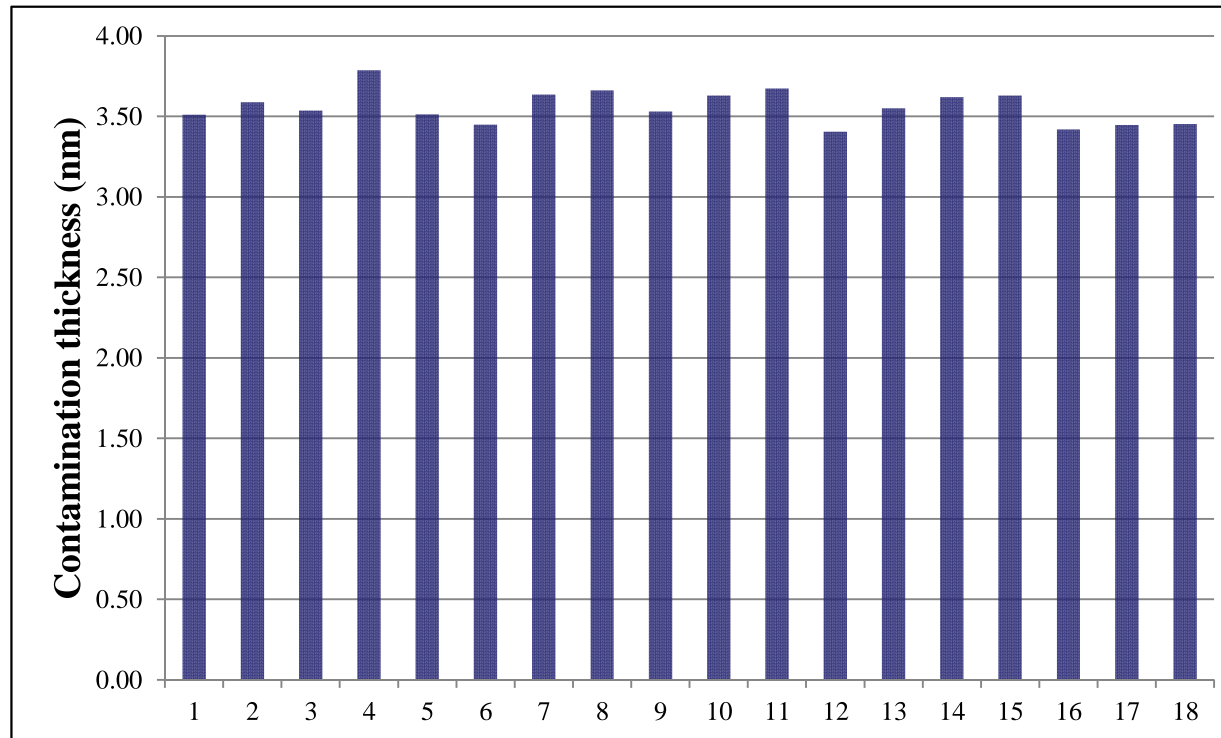
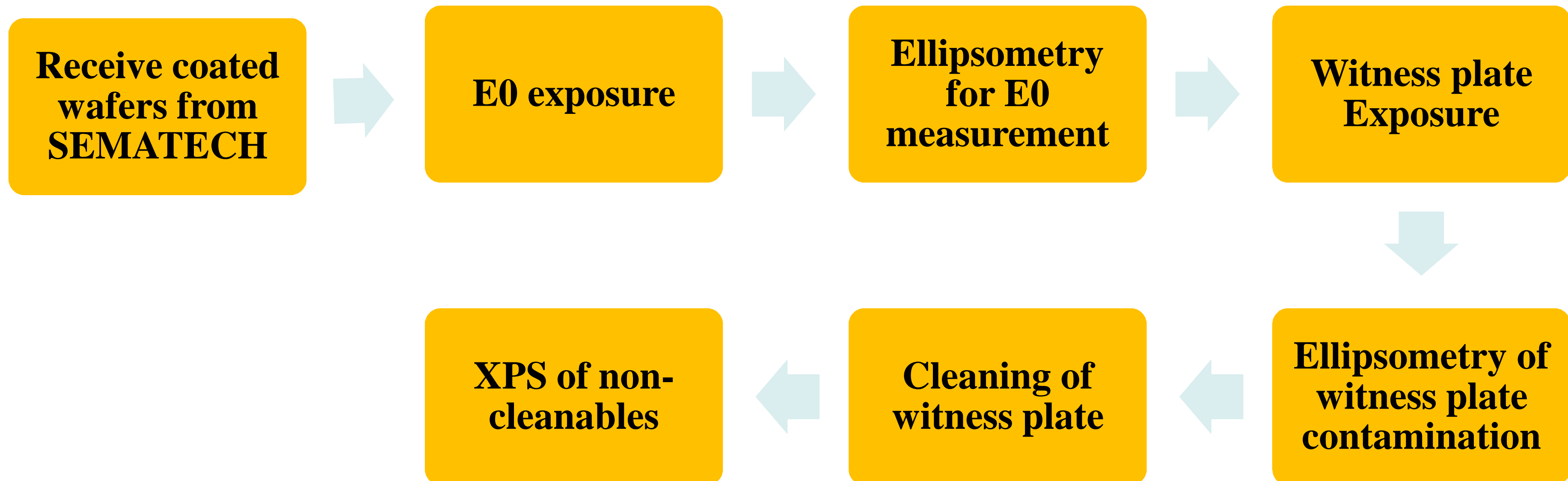
Sample results showing repeatability



18 witness plate exposures over 6 days of the same resist have ellipsometry thickness measurements with 3σ < 10%

Process Flow



Throughput

Net plan is 14 new materials measured per month

Issue	Response
Limited XPS time on shared use tool	• Optimized the measurement process of existing XPS • Plan in place to get dedicated XPS
Limited Ellipsometry time on shared use tool	• Optimized the measurement process of existing ellipsometer • Plan in place to get dedicated ellipsometer
Cleaning cycle time uses tool exposure time	• Second cleaning system build in progress • Issue could be improved by increasing cleaning rate
Hours of available personnel coverage	• Optimized process flow, and use some evenings and weekends • Working toward plan for additional personnel when metrology no longer limits the throughput

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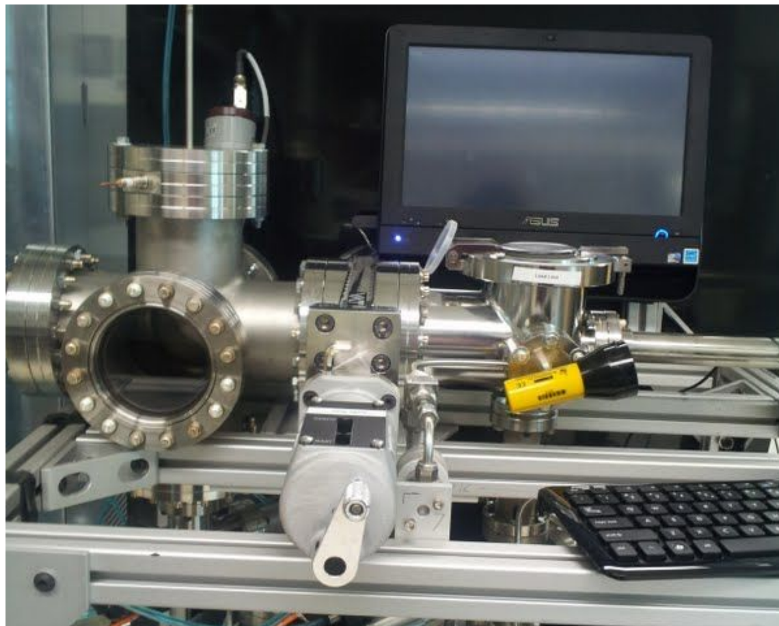
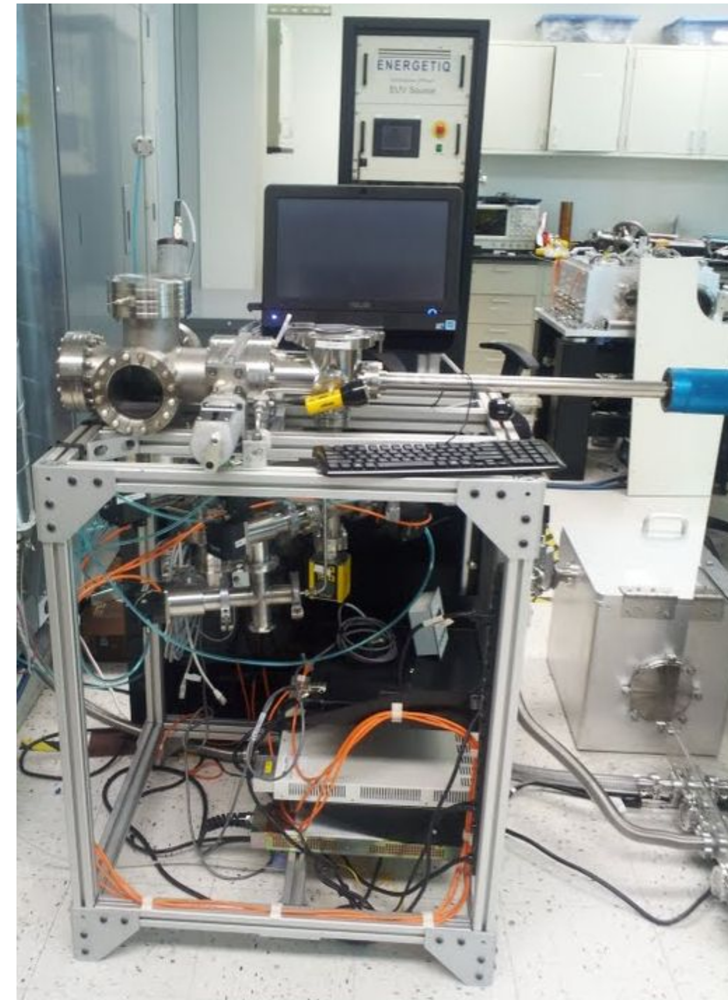
Second cleaning system build is in progress





This will relieve some of the time used on the exposure tool for the cleaning step