

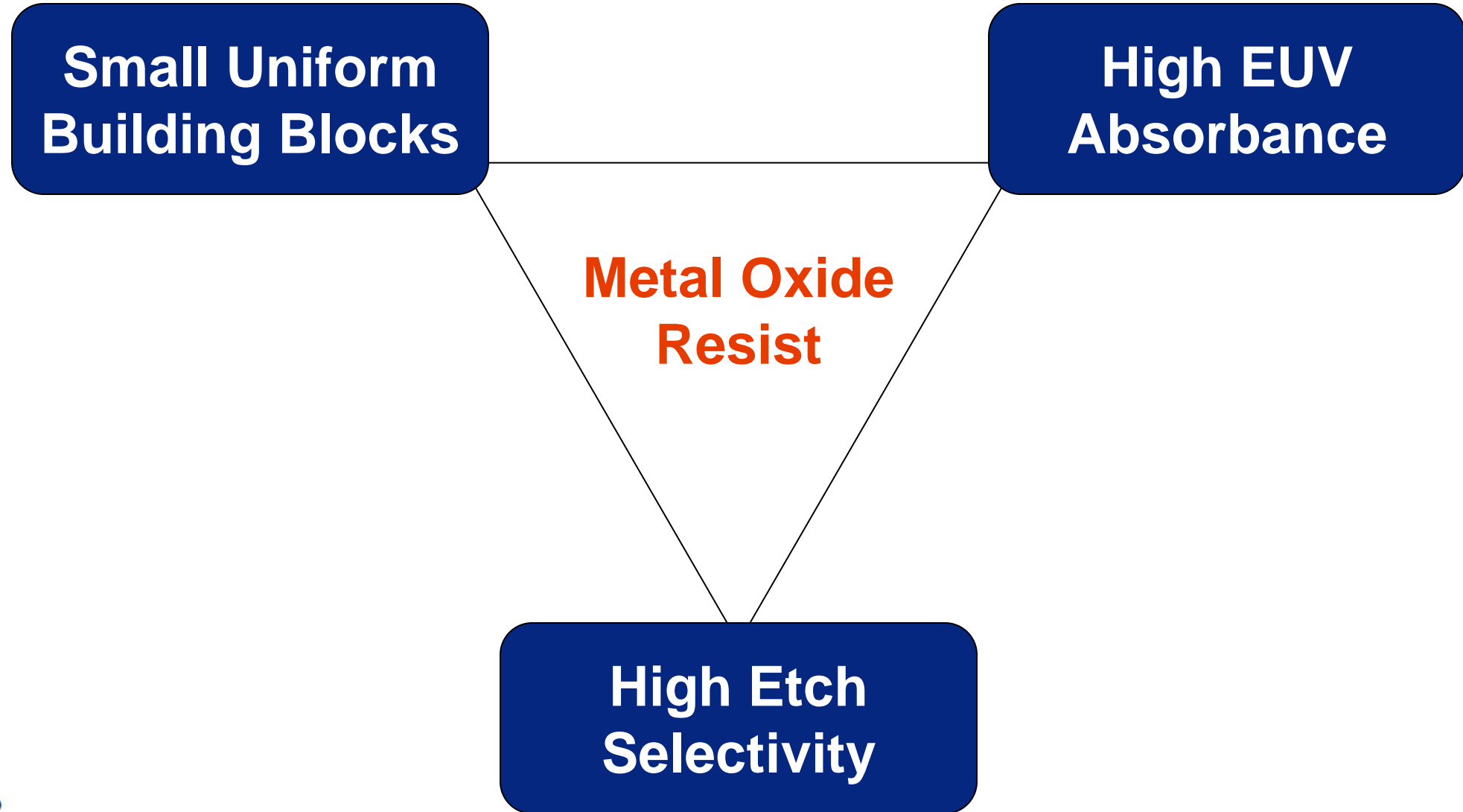
Accelerating Fab Integration of Metal Containing Resists

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2016 Resist TWG Meeting

Creating Resists Designed for EUV Lithography



Baseline Performance

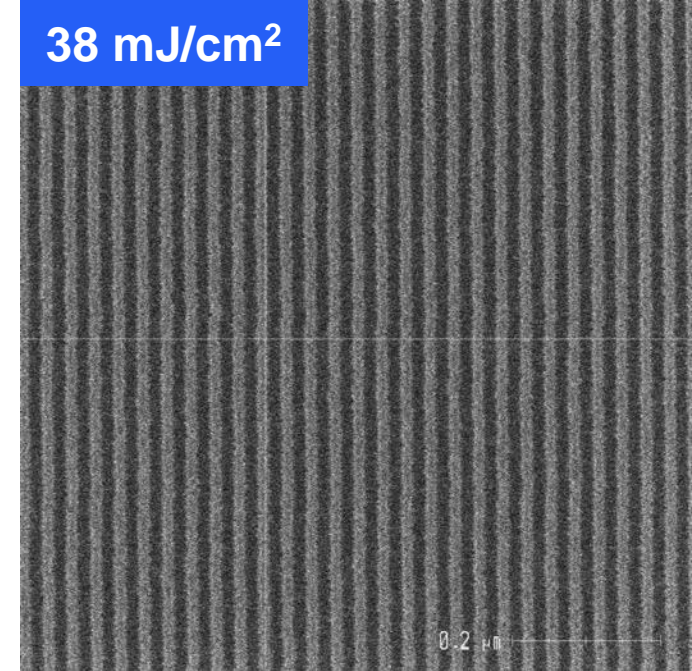
- E_{size} @ 16nm HP: ~37 mJ/cm²
 - EL_{max} : 29%
 - Resist thickness ~18nm
- Formulation scaled to multi-gallon batches for integration learning and process development
 - Multiple track/fab installs complete
- Integrated in IMEC iN7 Metal 2 Block Layer
 - Negative tone imaging
 - Process simplification

38 mJ/cm²

16L32P

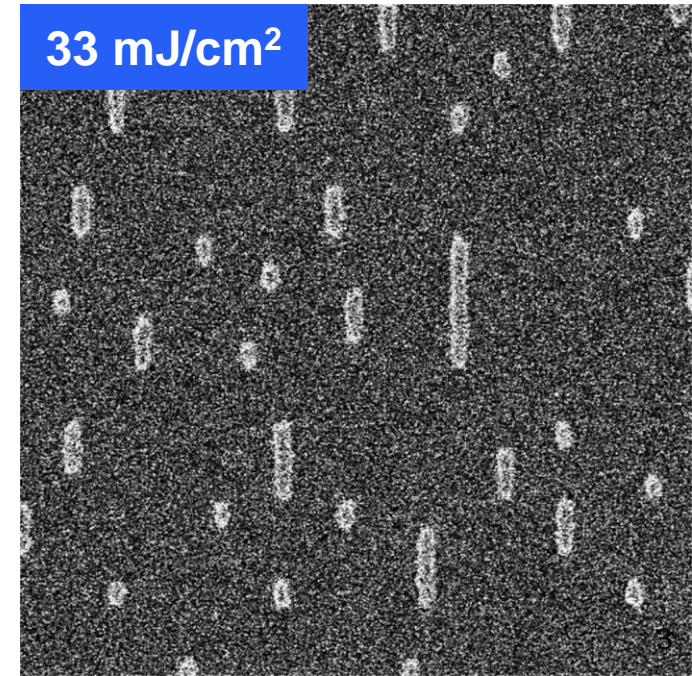
CD = 16.3 nm
LWR = 3.8 nm

NXE:3300
dip90Y



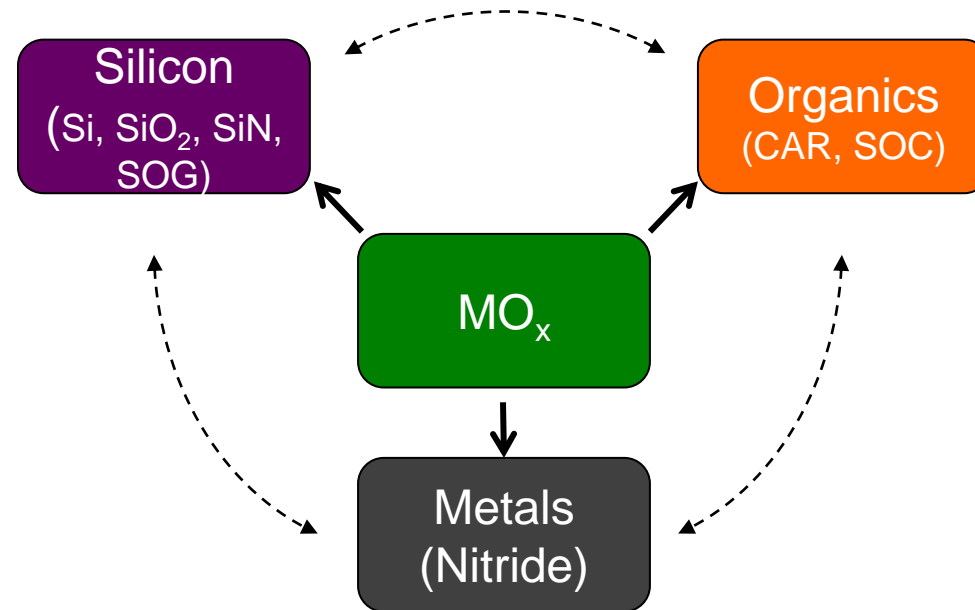
33 mJ/cm²

Block Mask
CD = 21 nm



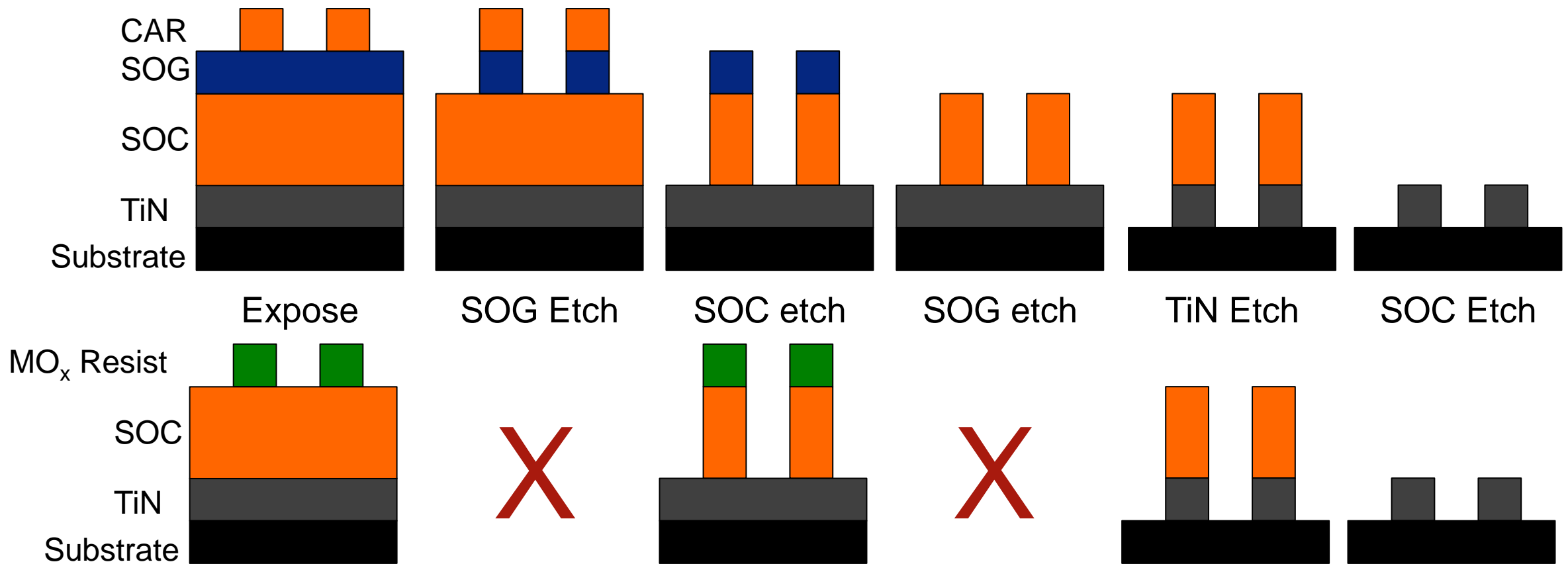
Integration Simplification

- New material properties of the resist enable simplification of standard stacks and etch



Integration Simplification

- Metal oxide composition enables simplification of standard stacks and etch



Metal Containing Resists for Fab Acceptance

- Intentional Metal: Sn

- Track
- Etch

Periodic Table of the Elements

Formulation:	YF-Series					
Batch:	Batch #1		Batch #2		Batch #3	
Element	ppb	ppb	ppb	ppb	ppb	ppb
Ag	<10	<10	<10	<10	<10	<10
Al	<10	<10	<10	<10	<10	<10
As	<10	<10	<10	<10	<10	<10
Au	<10	<10	<10	<10	<10	<10
Ba	<10	<10	<10	<10	<10	<10
Ca	<10	<10	<10	<10	<10	<10
Cd	<10	<10	<10	<10	<10	<10
Co	<10	<10	<10	<10	<10	<10
Cr	<10	<10	<10	<10	<10	<10
Cu	<10	<10	<10	<10	<10	<10
Fe	<10	<10	<10	<10	<10	<10
K	<10	<10	<10	<10	<10	<10
Li	<10	<10	<10	<10	<10	<10
Mg	<10	<10	<10	<10	<10	<10
Mn	<10	<10	<10	<10	<10	<10
Na	<10	<10	<10	<10	<10	<10
Ni	<10	<10	<10	<10	<10	<10
Pd	<10	<10	<10	<10	<10	<10
Sn	matrix	matrix	matrix	matrix	matrix	matrix
Ti	<10	<10	<10	<10	<10	<10
V	<10	<10	<10	<10	<10	<10
W	<10	<10	<10	<10	<10	<10
Zn	<10	<10	<10	<10	<10	<10

- Unintentional Metals: Impurities

- Developed ICP-MS methods to eliminate mass interferences from Sn
 - Enabling Lower Detection Limits
 - Example: isotope overlap between ^{112}Sn and ^{112}Cd
- Demonstrated multiple large batches with no detectable trace metals

THANK YOU!



... and to all of our partners