AZ Electronic Materials

AZ 193nm/248nm Top Anti-Reflective Coating

General Products Update

January 2005

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AZ 193nm/248nm T.A.R.C. Series
Category and Capability

	AZ AQUATAR-III Coating	EXP AQUATAR-VIII-A Coating	AZ AQUATAR-VI Coating	Experimental Material (TBD)
Application	248nm Process	248nm Process Applicable for 193nm Process	193nm Process	193nm Process
Features	Existing Standard Material for 248nm Process (POFS contained)	Newly Developed PFOS/A Free Material	Existing Standard Material for 193nm Process (PFOS contained)	Newly Developed PFOS/A Free Material
Refractive Index	n@248nm : 1.43 k@248nm : 0.00	n@248nm : 1.44 (n@193nm : 1.51) k@248nm : 0.00 (k@193nm : 0.0043)	n@193nm : 1.45 k@193nm : 0.084 (n@248nm : 1.44)	n@193nm : 1.4x (TBD) k@193nm : 0.0x (TBD)
Cauchy Coefficients	A = 1.381 B = 0.00647μm^2 C = 0.00μm^4	A = 1.3839 B = 0.0050346μm^2 C = 0.00μm^4	A = 1.379 B = 0.00262μm^2 C = 0.00μm^4	A = (TBD) B = (TBD) C = (TBD)

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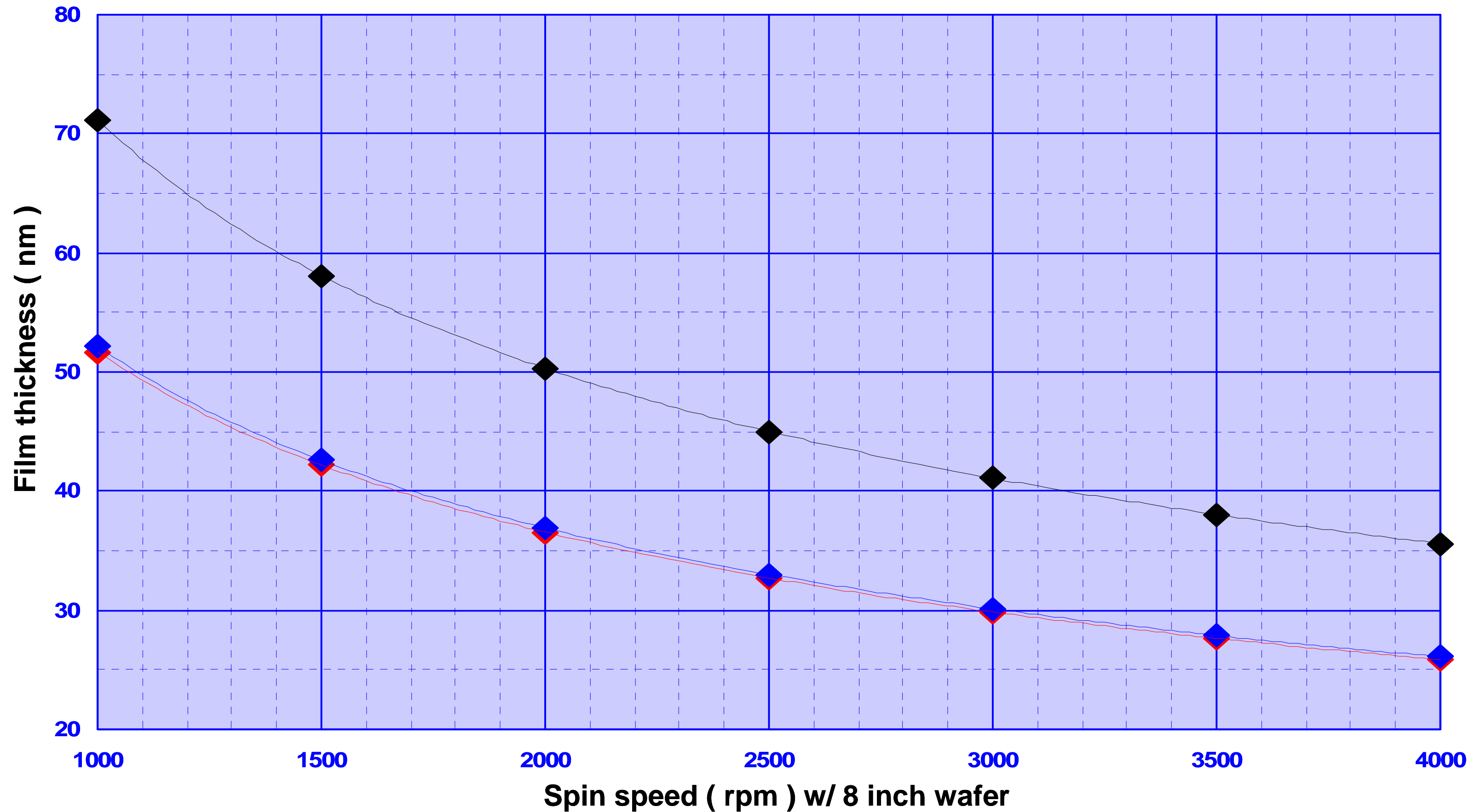
AQUATAR-III & EXP AQUATAR-VIII-A Series Spin Curve



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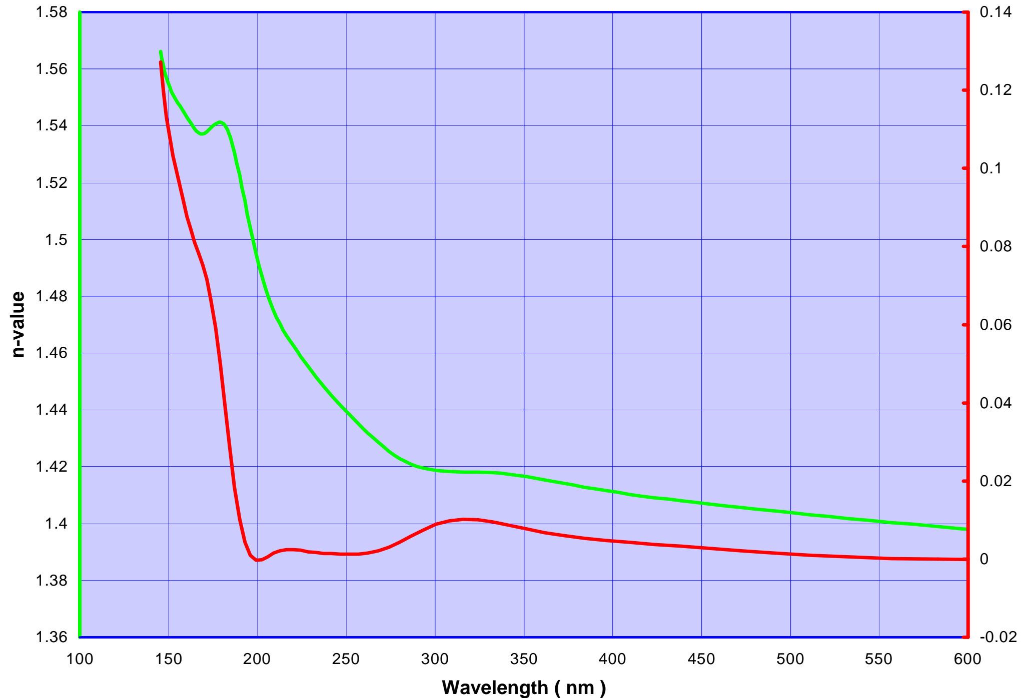
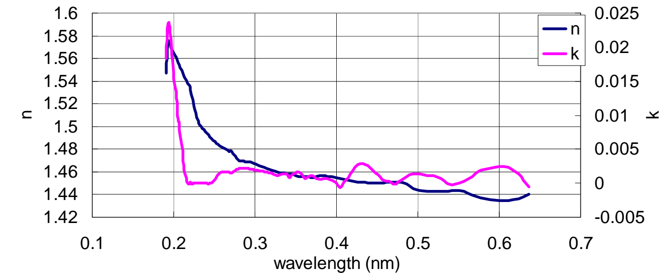
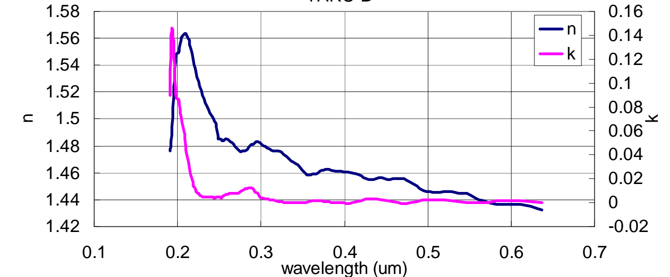
Comparison of n/k value
EXP AQUATAR-VIII-A vs. Competitive TARC





TARC-A
n@248nm : 1.48
k@248nm : 0.00

Ellipsometer : J. A. Woollam VUV-VASE
Film thickness: 45nm
n@248nm : 1.440
k@248nm : 0
Cauchy parameters(0.5um-0.65um):
A=1.3839, B=0.0050346, C=0



TARC-B
n@248nm : 1.48
k@248nm : 0.0049

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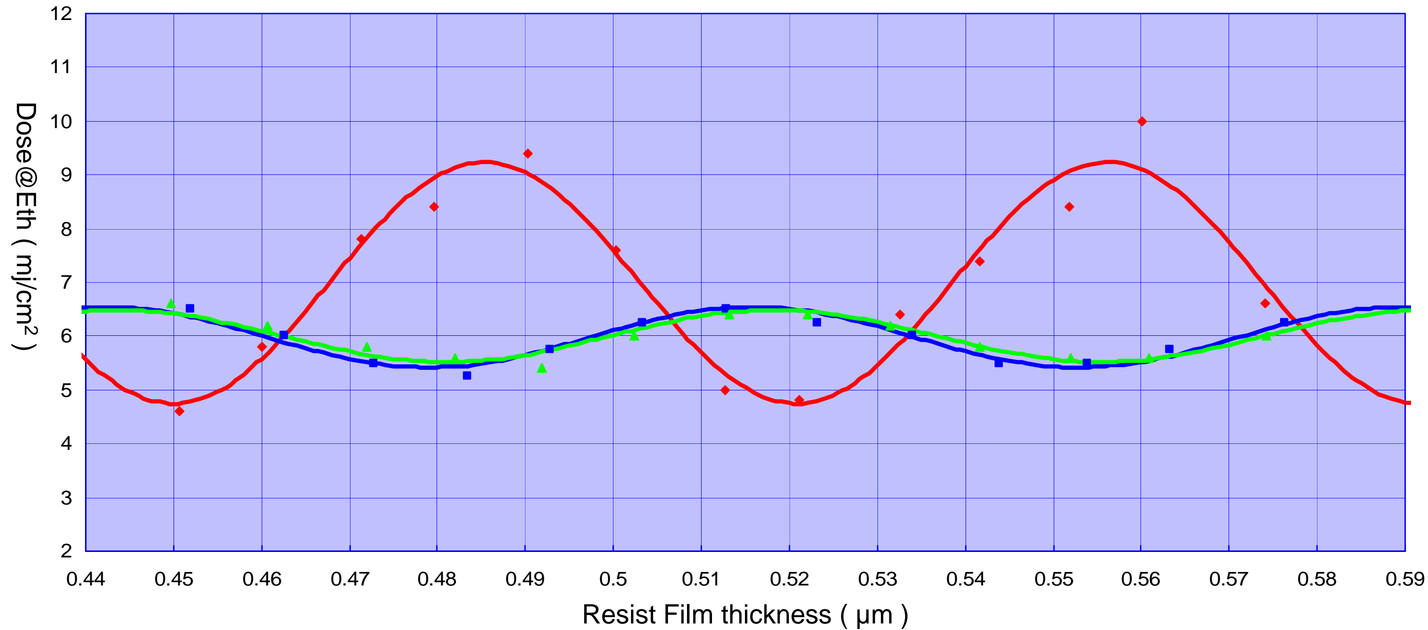
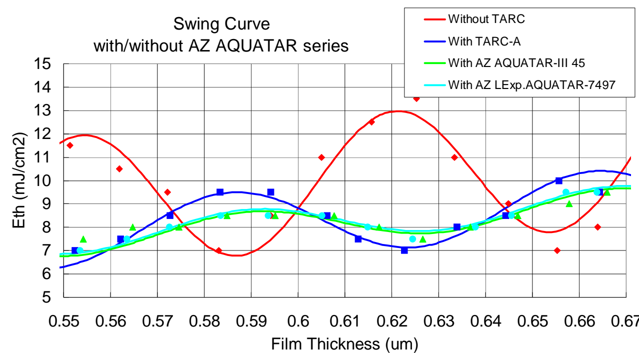
Swing Suppression Effect

EXP AQUATAR-VIII-A vs. AZ AQUATAR-III





Swing Suppression

EXP AQUATAR-VIII-A : 86.5%

AZ AQUATAR-III : 86.5%

TARC-A : 65.0%

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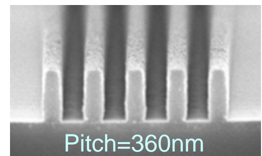
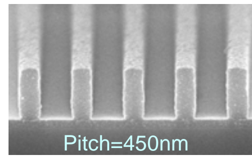
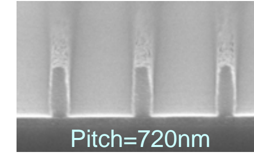
EXP AQUATAR-VIII-A
Resist Compatibility – Acetal Type

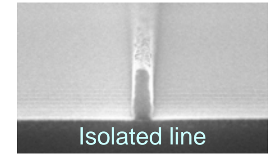
Line & Space Patterns : CD=180nm

w/o TARC

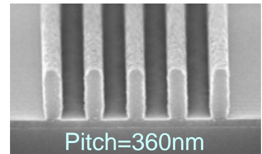


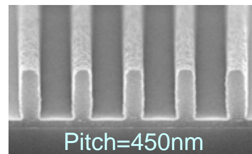


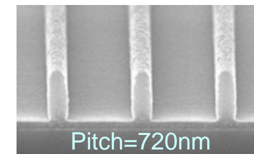


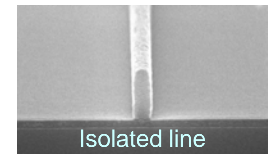


with AQUATAR-VIII-A





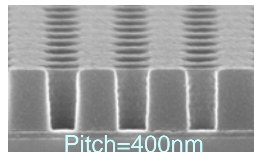


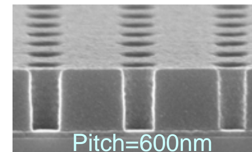


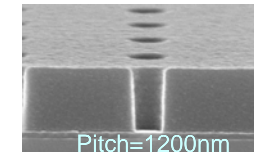
Process Conditions
Film thickness : 45nm (TARC), 510nm (PR), 80nm (BARC)
SB : 90ºC/60sec. (TARC), 90ºC/90sec. (PR),180ºC/60sec. (BARC),   PEB : 110ºC/60sec
Exposure : 0.63NA/0.65sigma,   Mask : Binary,   Development : 2.38%TMAH 60sec.

Contact Patterns : CD=200nm

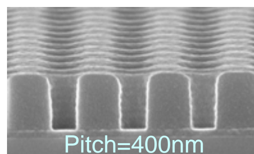
w/o TARC

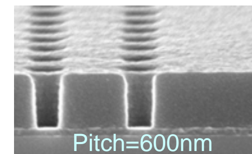


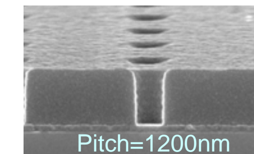




with AQUATAR-VIII-A







Process Conditions
Film thickness : 45nm (TARC), 585nm (PR), 80nm (BARC)
SB : 90ºC/60sec. (TARC), 90ºC/60sec. (PR),180ºC/60sec. (BARC), PEB : 120ºC/60sec
Exposure : 0.63NA/ 1/2annular, Mask : HT-PSM, Development : 2.38%TMAH 60sec.

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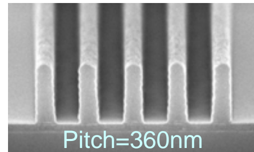
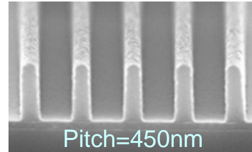
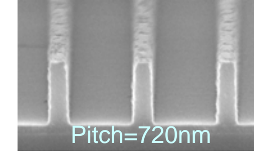
EXP AQUATAR-VIII-A
Resist Compatibility – ESCAP Type

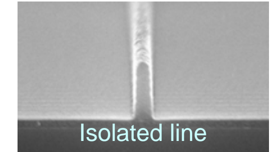
Line & Space Patterns : CD=180nm

w/o TARC

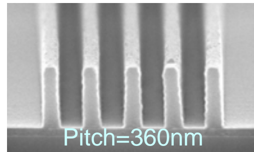


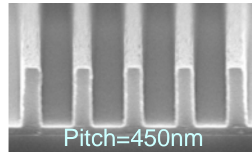


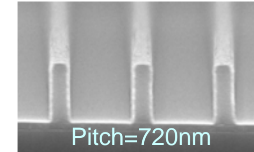


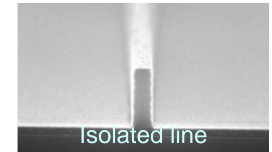


with AQUATAR-VIII-A







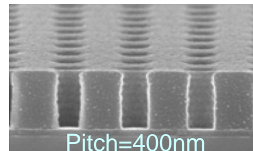


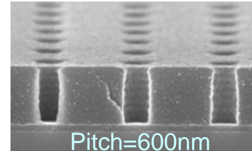
Process Conditions

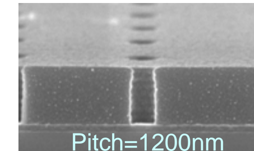
Film thickness : 45nm (TARC), 540nm (PR), 80nm (BARC)
SB : 90ºC/60sec. (TARC), 130ºC/60sec. (PR),180ºC/60sec. (BARC), PEB : 110ºC/60sec
Exposure : 0.63NA/0.65sigma, Mask : Binary, Development : 2.38%TMAH 60sec.

Contact Patterns : CD=200nm

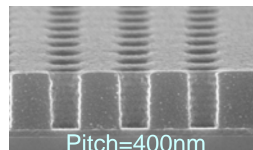
w/o TARC

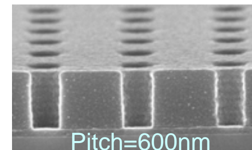


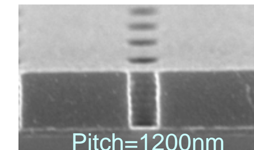




with AQUATAR-VIII-A







Process Conditions

Film thickness : 45nm (TARC), 522nm (PR), 80nm (BARC)
SB : 90ºC/60sec. (TARC), 120ºC/90sec. (PR),180ºC/60sec. (BARC), PEB : 130ºC/60sec
Exposure : 0.63NA/ 1/2annular, Mask : HT-PSM, Development : 2.38%TMAH 60sec.

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AZ AQUATAR-III Coating
CD Uniformity Improvement Effect

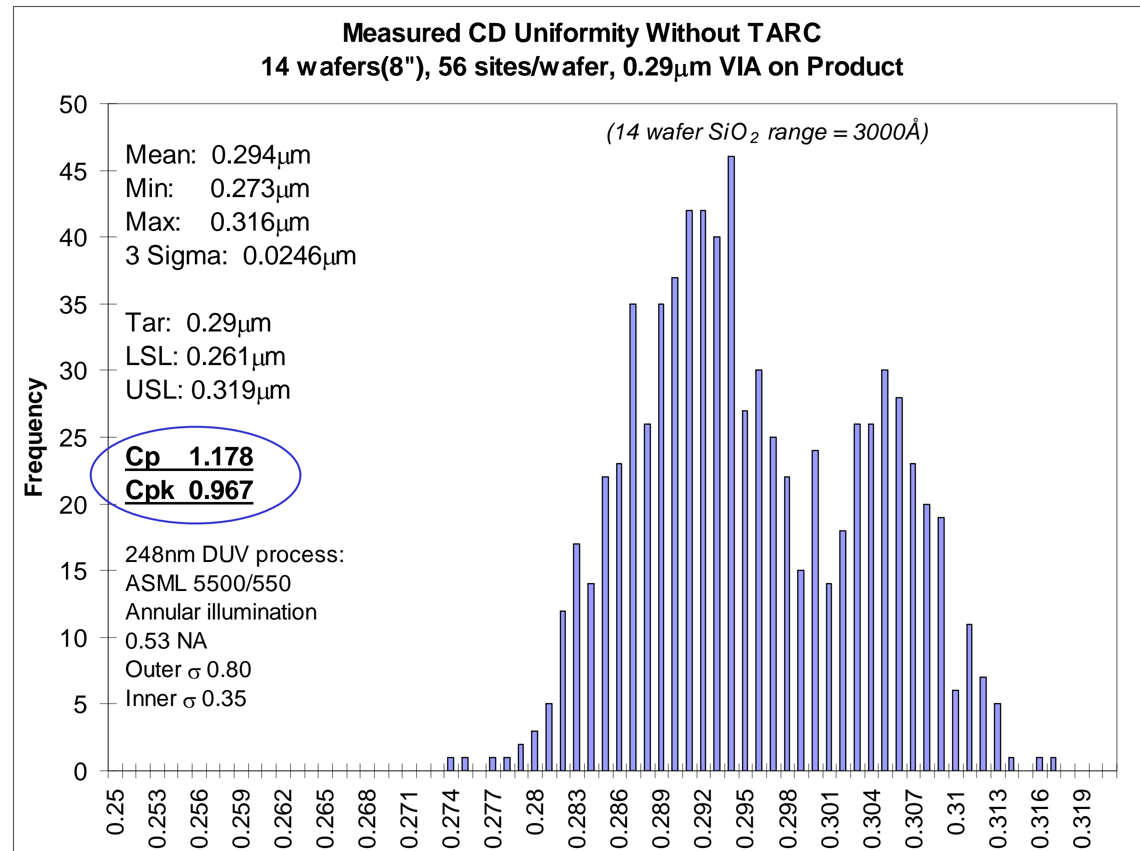
without AZ AQUATAR-III

Process Conditions:

14 wafers with topography

Oxide thickness increment of ~250Å per wafer for 3000Å range across all 14 wafers (worst CMP lot to lot process variation prediction)

DUV resist process without TARC.



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AZ AQUATAR-III Coating
CD Uniformity Improvement Effect

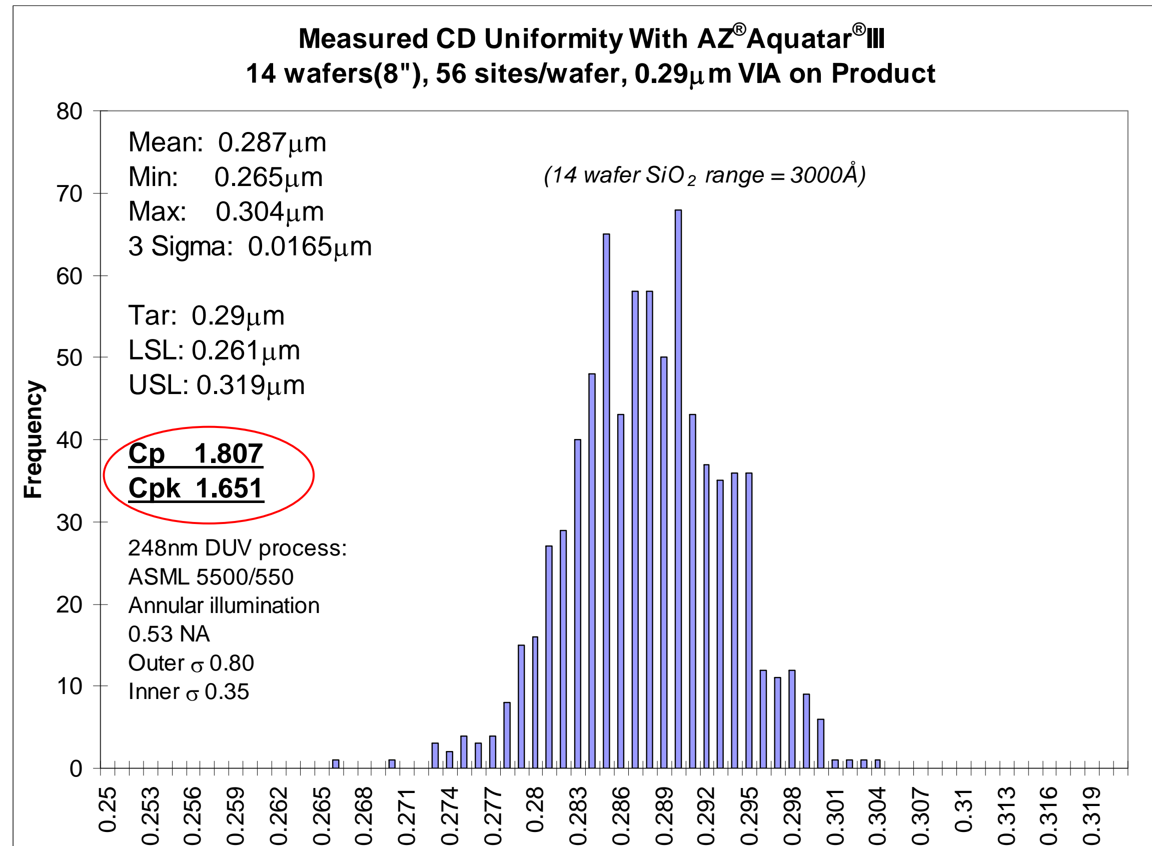
without AZ AQUATAR-III

Process Conditions:

14 wafers with topography

Oxide thickness increment of ~250Å per wafer for 3000Å range across all 14 wafers (worst CMP lot to lot process variation prediction)

DUV resist process with AZ AQUATAR-III



70% Improvement in Cpk

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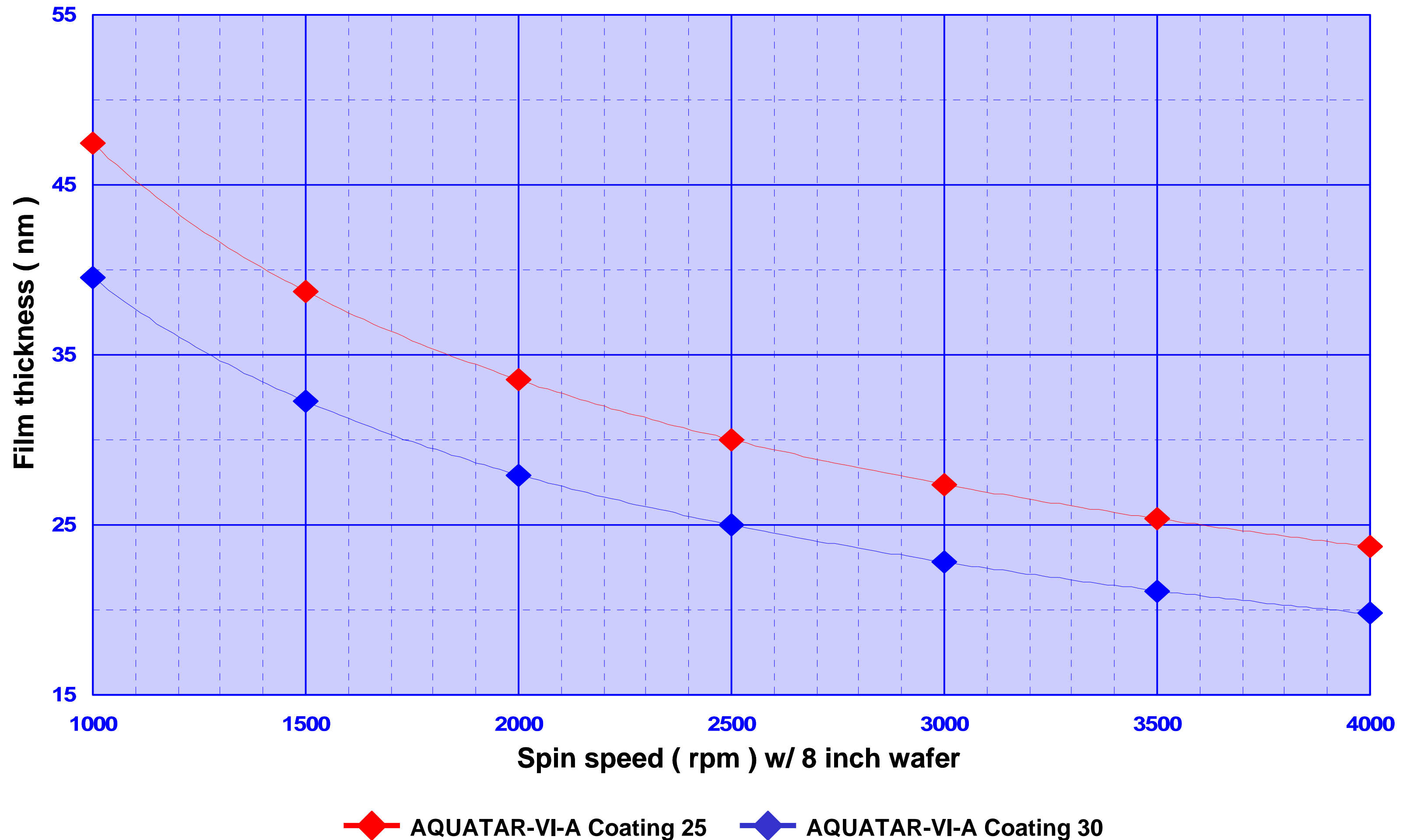
AZ AQUATAR-VI-A Series Spin Curve



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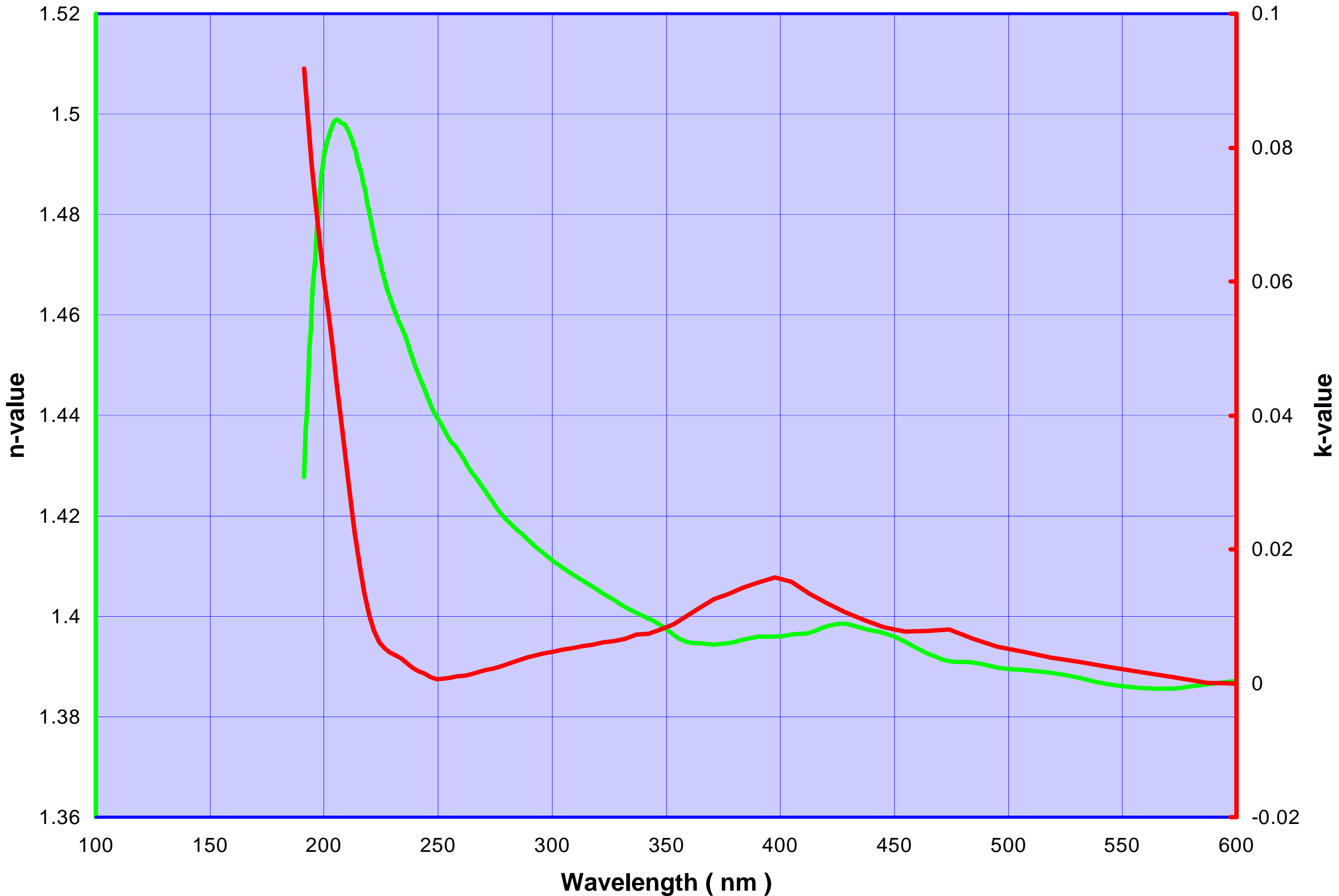
Optical Parameters, n/k value



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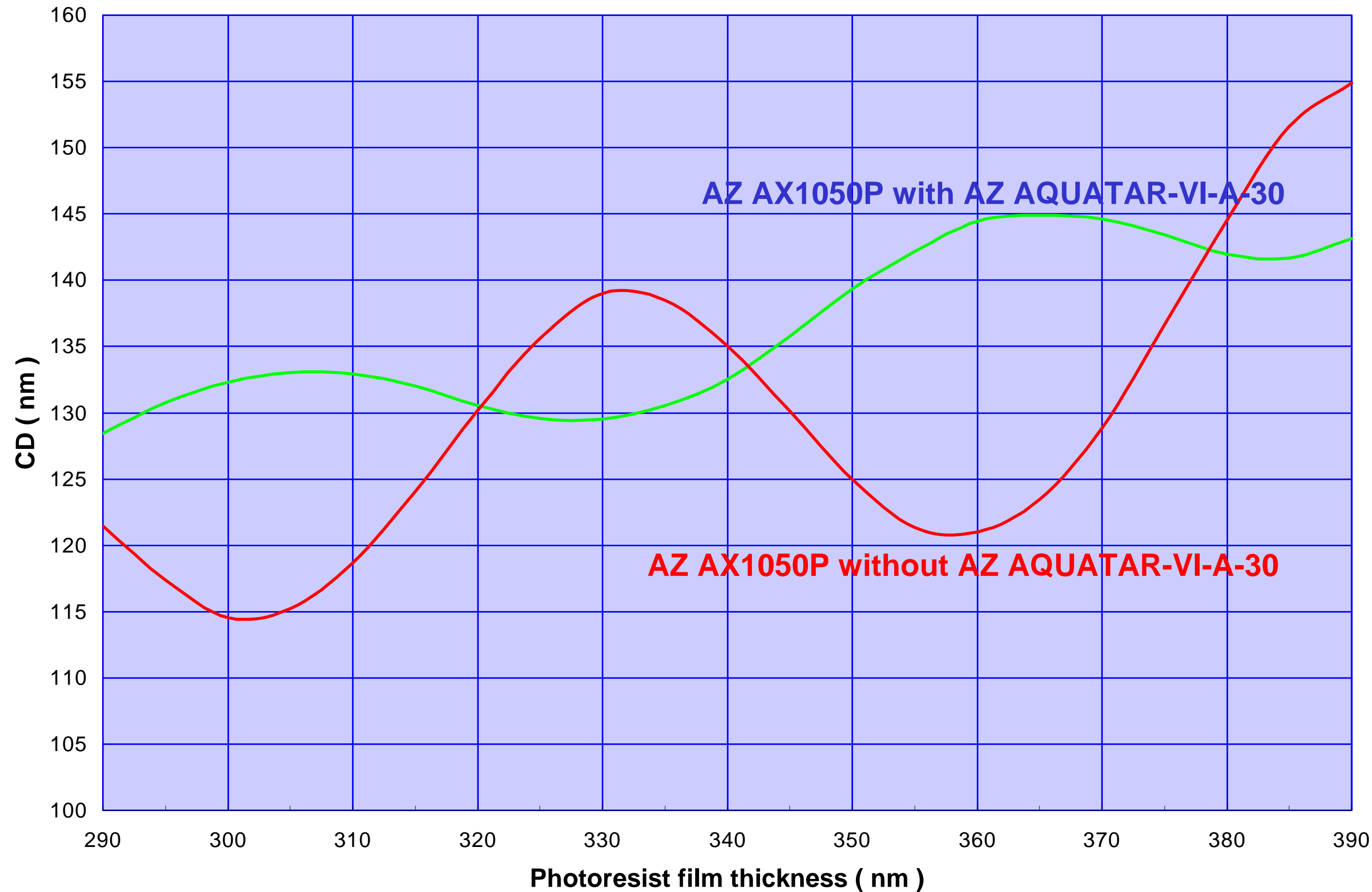
Swing Suppression Effect



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