# パノラミックテクノロジー NTDレジストモデル

トム・ピスター
パノラミックテクノロジー社

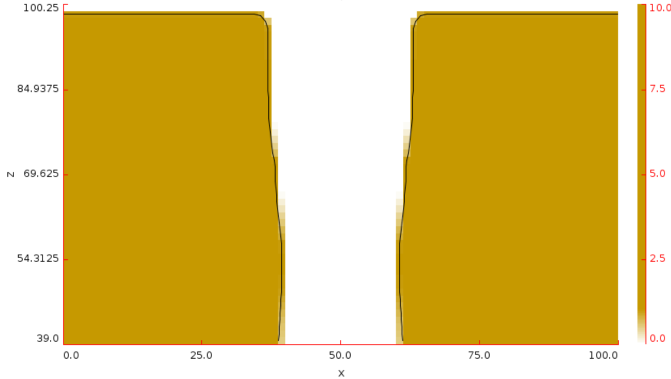
Panoramic Technology

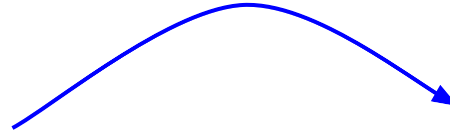
# 脱保護による収縮

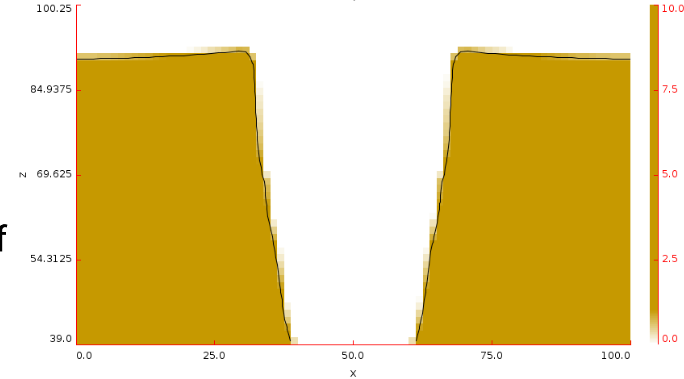
- 科学的に増幅させたレジストにおける脱保護反応は、フォトレジスト内の体積収縮を引き起こすことが知られています。（(参考： Pistor et. al, “Photoresist shrinkage effects at EUV”,Proc. SPIE 7969, Extreme Ultraviolet (EUV) Lithography II, 796917 (April 07, 2011) )
- ポジ型現像のレジストでは、脱保護による収縮は重要ではありませんでした。と言うのは、収縮するレジストの領域が、現像剤により除去される領域だったからです。
- *しかし、NTDレジストでは、収縮する領域が残ることになります!*

Panoramic Technology

# Deprotection Shrinkage (cont'd)






*Volumetric shrinkage proportional to the amount of deprotection

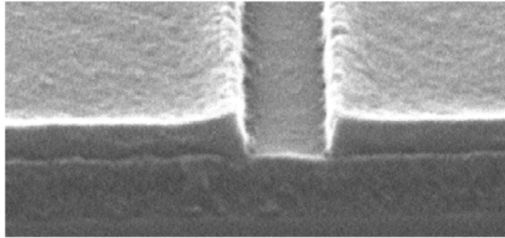
*base of resist remains fixed to substrate

*resist thickness loss is observed

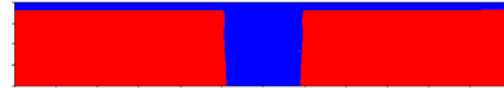
*trench widens as a result of shrinkage

Panoramic Technology

# Another example of deprotection shrinkage

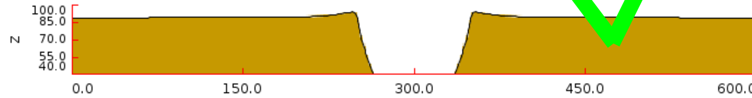


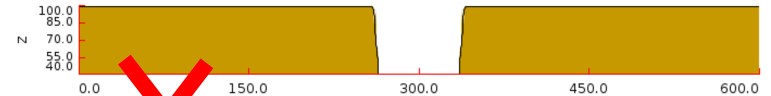
100 nm Trench
600 nm Pitch



Wrong profile!

http://www.sematech.org/meetings/archives/litho/8940/pres/MaP1_04_Stewart%20Robertson_2.pdf

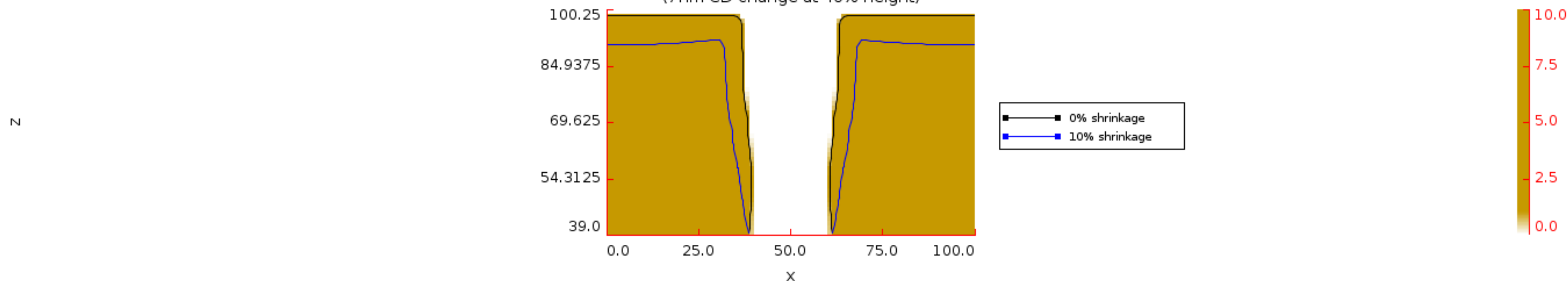


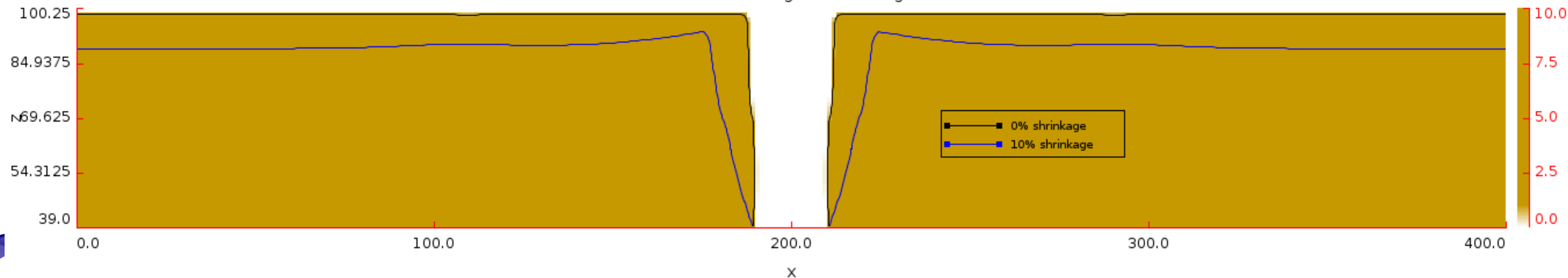




Wrong profile!

Panoramic Technology

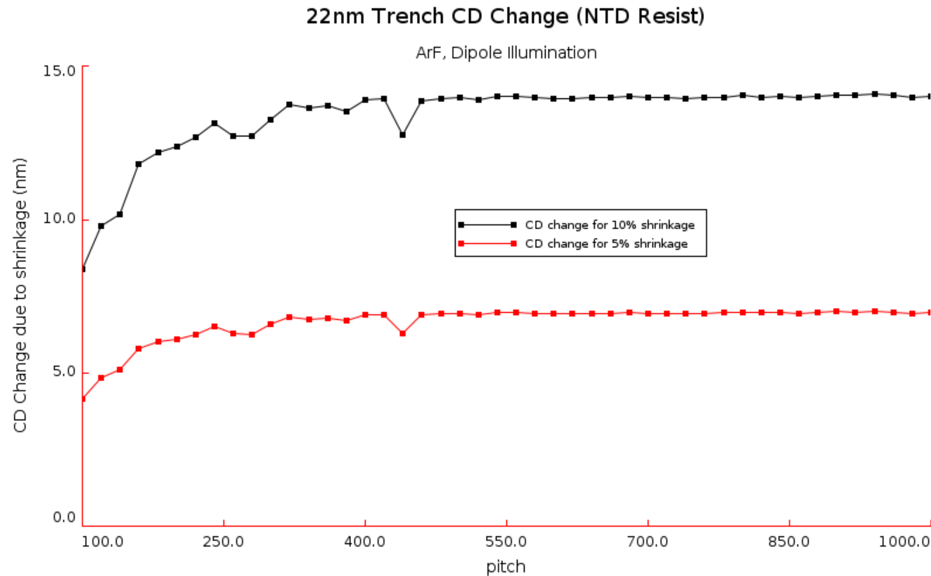
# More resist between trenches means more shrinkage



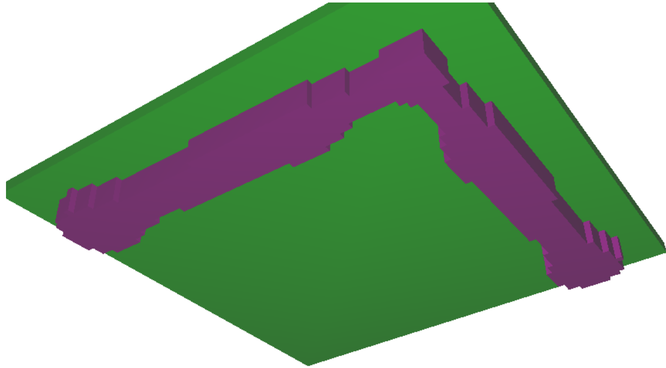

Panoramic Technology

# Shrinkage effect saturates around 300nm

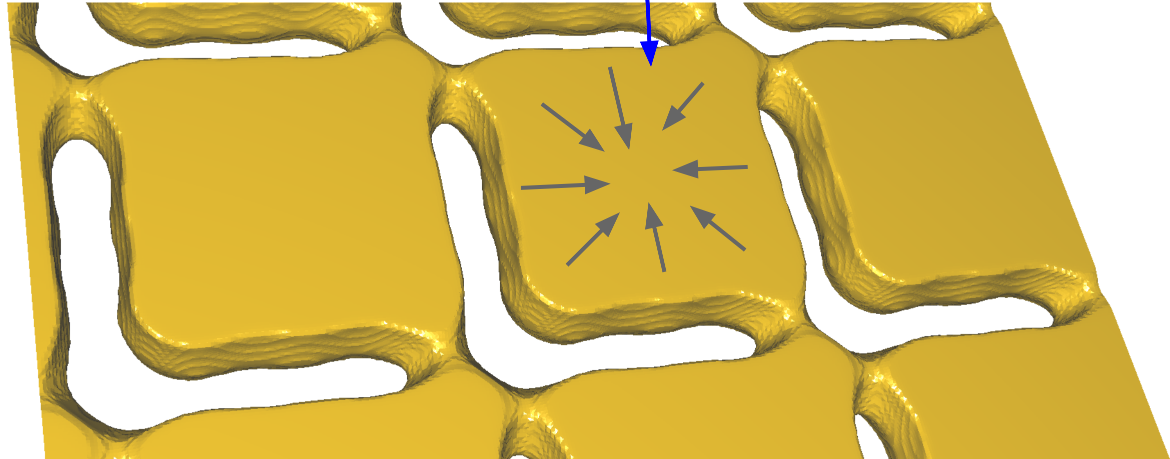



Panoramic Technology

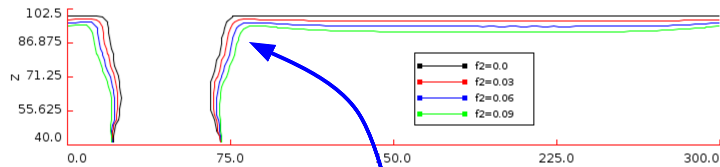
# 2D Example: 30nm Elbow



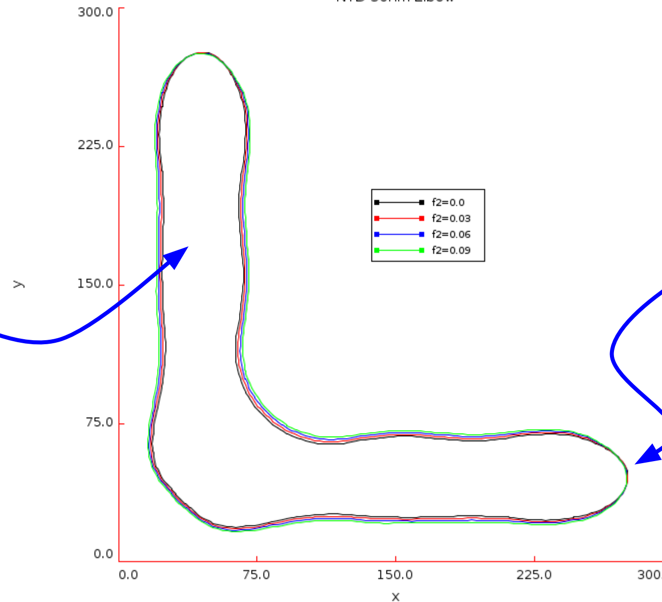
Expect the shrinkage of this large area to affect trench width.



# 2D Example: 30nm Elbow



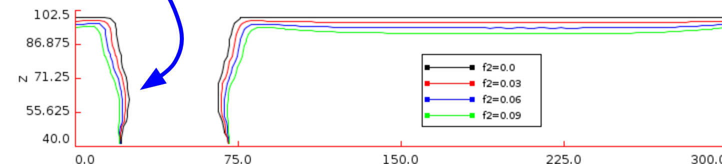

Quite a lot of change in the trench width due to shrinkage



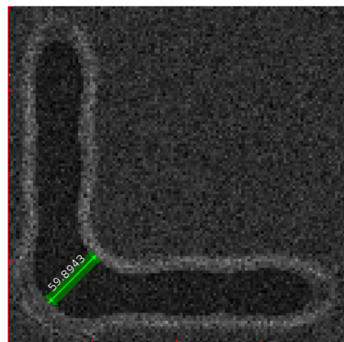

Not much shrinkage effect at trench end because there's not much resist to shrink.

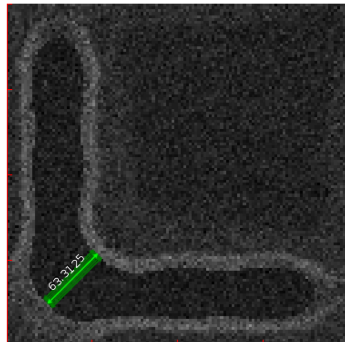
Panoramic Technology

# 2D Example: 30nm Elbow

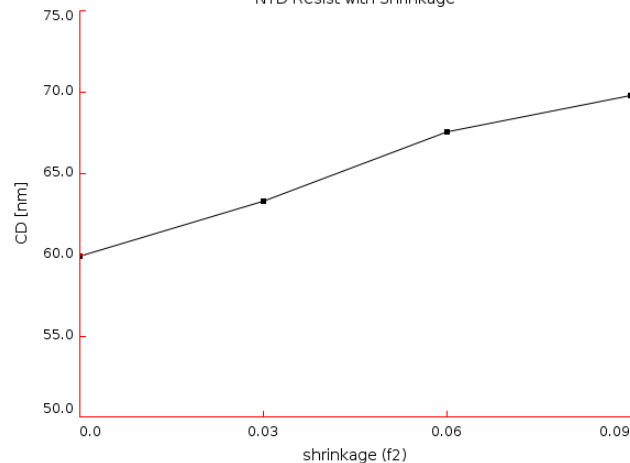



Reentrant profile (SEM doesn't see bottom of resist)



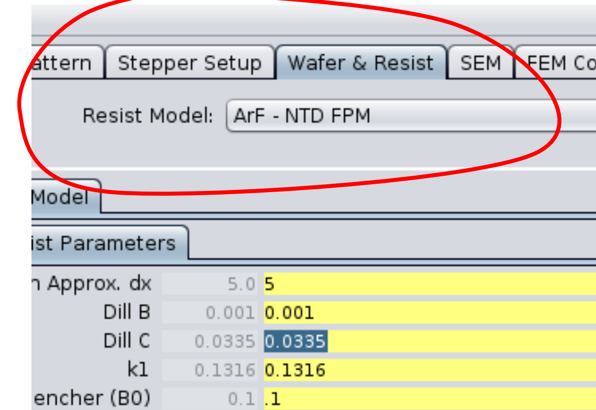

Large CD change in SEM image because profile is "reentrant", so SEM doesn't see the bottom (which is fixed)




Panoramic Technology

# Panoramic Technology NTD Resist Model

- Available 2014 Q2 (in version 7)
- See also
  - SEM Image Simulation and Analysis
  - v7 performance enhancements
  - Source Optimization & OPC




Panoramic Technology