Fast nanoimprint lithography simulation for process design · Hayden Taylor, UC Berkeley

Resist surface's impulse response

1

— Resist

— Substrate
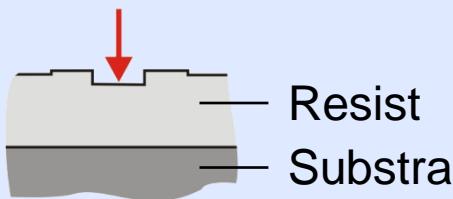
Stamp's load response (bending, indentation)

2

— Stamp

— Resist
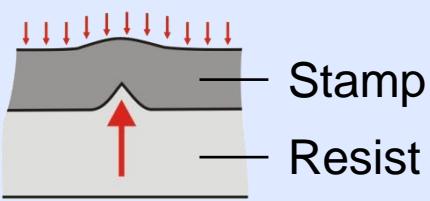
Pattern abstraction

3

Density 1 0.5 0

4
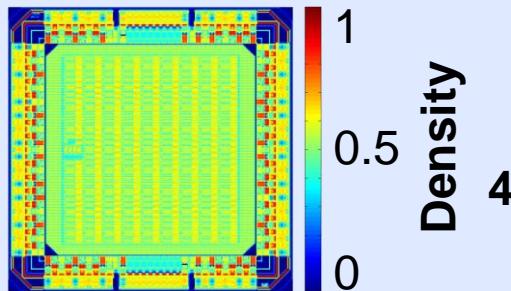
## Example questions:

Does changing stamp material affect residual layer uniformity? [1,2]

Elastomer

165

(nm)

10

Silicon

99

92
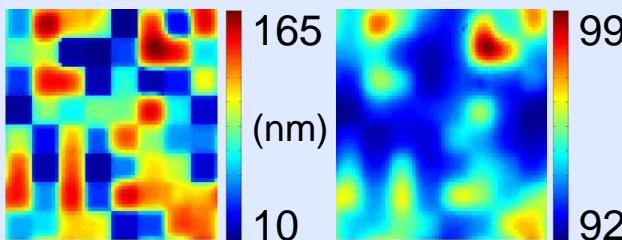
Can 'dummy fill' accelerate stamp cavity filling? [3]

Proportion cavities filled

with fill

no fill
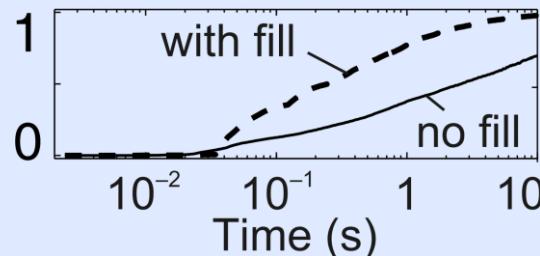
Time (s)

Simulations need to be highly scalable

$\sim O(N^2 \log N)$

Time (s): 10^4, 10^3, 10^2, 10^1

Simulation size, N: 10^1 10^2 10^3 10^4

←— N —→
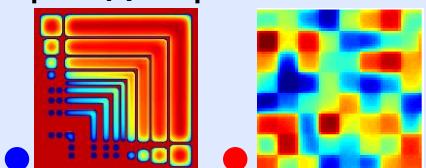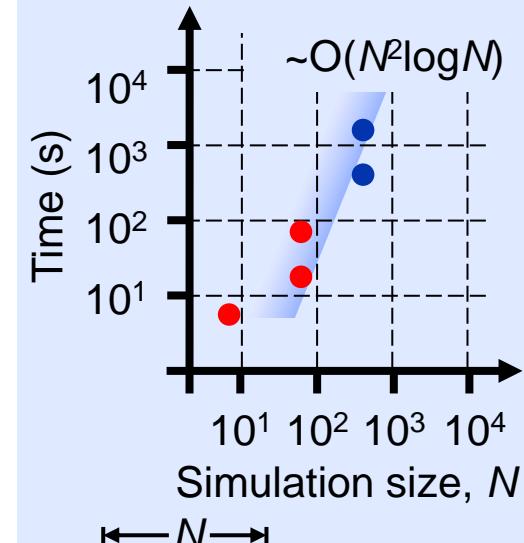
- At least 10^3 times faster than FEM
- Can balance spatial resolution and speed

[1] Taylor *NNT* 2009, 2011; [2] Taylor *SPIE* 7641 2010; [3] Boning *et al. NNT* 2010