CLAIMS

What is claimed is

1. A method of film deposition on a patterned substrate using inkjets, the method comprising:

determining global and nanoscale topography and pattern information of the patterned substrate;

determining, based upon the global and nanoscale topography, the pattern information, and a desired film thickness profile of the deposited film, a drop pattern;

dispensing the drop pattern on the patterned substrate;

closing a gap between the patterned substrate and a superstrate causing the dispensed drops to form a substantially contiguous film;

curing the substantially contiguous film; and

separating the superstrate and the patterned substrate from the substantially contiguous film on the patterned substrate.

2. The method of claim 1, wherein the drop pattern is determined from a model of a process, an optimization scheme, and experimental data.

3. The method of claim 1, further comprising loading a digital file encoded with data representing the global and nanoscale topography and the pattern information of the patterned substrate.

4. The method of claim 1, wherein the drop pattern is computed using model-based optimization with inputs including the global and nanoscale topography and the pattern information, superstrate geometry, superstrate material properties, inkjetted material properties, inkjet drop resolution, inkjet nozzle pitch, and tolerance information.

5. The method of claim 1, wherein curing is performed at the end of a desired process time, where the desired process time is chosen to be high enough such that bubbles are substantially mitigated and low enough to prevent undesirable parasitics.

6. The method of claim 1, wherein a thickness of the superstrate is designed to be spatially varying.

7. A method for mitigation of hot spots arising from a film deposition process, the method comprising:

identifying a hot spot on a substrate;

identifying, based upon characteristics of the hot spot, a compensation solution that includes controlled evaporation, a pressure zone chuck, a digital micromirror device, or a programmable heater array; and

implementing the compensation solution to mitigate the hot spot.

8. A method for mitigation of hot spots arising from a nanoimprint lithography process, the method comprising:

identifying a hot spot prior to a beginning of or during the nanoimprint lithography process;

identifying, based upon characteristics of the hot spot, a compensation solution that includes controlled evaporation, a pressure zone chuck, a digital micromirror device or a programmable heater array; and

implementing the compensation solution to mitigate the hot spot.

9. A system for film deposition, the system comprising:

a processor;

a substrate shape modulation chuck under the control of the processor;

a superstrate shape modulation chuck under the control of the processor; and

a memory having stored thereon a set of instructions that when executed by the processor cause a machine to:

identify time varying shapes of a substrate and a superstrate to maximize a relative curvature between the substrate and the superstrate at all times between initiation of contact and completion of substantially conformal contact between the substrate and the superstrate,

wherein at least one of two curvatures of the superstrate and the substrate at least one time between the initiation of contact and

the completion of substantially conformal contact between the substrate and the superstrate is concave.

10. The system of claim 9, further comprising a camera having one of the following features: RGB pixels, grayscale pixels, a linescan configuration, an areascan configuration, a telecentric configuration, and a camera pixel size of at least 100 ums, at least 10 ums, or at least 1 ums.

11. The method of claim 1, wherein the desired film thickness profile is chosen to optimize functional behavior of the patterned substrate comprising a desired substrate's optical properties.

12. The method of claim 1, wherein the patterned substrate is subjected to etch back.

13. The method of claim 7, wherein the digital micromirror device or the programmable heater array is configured to induce thermo-capillary flow in a vicinity of the hot spot.

14. The method of claim 7, wherein the substrate is patterned, and wherein the hot spot includes variable process times, variable pattern densities, or contact line pinning.

15. The method of claim 14, wherein the digital micromirror device or the programmable heater array is configured to induce thermo-capillary flow in a vicinity of the hot spot.

16. A device having a film deposited on a patterned substrate using the method of claim 1.