CLAIMS:

1. A process for depositing thin films, the process comprising:

dispensing drops of a pre-cursor liquid organic material at a plurality of locations on a substrate by an array of inkjet nozzles;

bringing down a superstrate thereby allowing said drops to form a contiguous film captured between said substrate and said superstrate;

enabling a non-equilibrium transient state of said superstrate, said contiguous film and said substrate to occur after a duration of time;

curing said contiguous film to solidify it into a solid; and

separating said superstrate from said solid thereby leaving a polymer film on said substrate.

2. The process as recited in claim 1 further comprising:

bringing down said superstrate that has been bowed due to a backside pressure such that a first contact on said drops is made by a front side of said superstrate thereby initiating a liquid front that spreads outward merging with said drops to form said contiguous film.

3. The process as recited in claim 2 further comprising:

bringing down said superstrate such that said first contact on said drops is made by said front side of said superstrate in a local atmosphere of gases that are soluble in organic liquids.

4. The process as recited in claim 2 further comprising:

bringing down said superstrate such that said first contact on said drops is made by said front side of said superstrate in a local atmosphere of helium or carbon dioxide.

5. The process as recited in claim 1, wherein said superstrate is porous and allows trapped gases to be transmitted.

6. The process as recited in claim 1, wherein said superstrate comprises a material of glass, ceramics, polymers or combinations thereof.

7. The process as recited in claim 1, wherein a surface of said superstrate is coated with a low surface energy coating, wherein a surface of said substrate is coated with an adhesion promoter.

8. The process as recited in claim 1, wherein said contiguous film is cured by photonic or thermal energy to solidify said contiguous film into said polymer.

9. The process as recited in claim 1, wherein said contiguous film is cured by exposure to ultraviolet radiation through said substrate or said superstrate.

10. The process as recited in claim 1, wherein said superstrate is a roll of plastic held under tension.

11. The process as recited in claim 10, wherein said substrate is composed of a material with a Young's modulus greater than 1 GPa.

12. The process as recited in claim 10, wherein said substrate is a rigid wafer composed of one or more of the following materials: silicon, silicon dioxide and gallium nitride.

13. The process as recited in claim 10, wherein a first portion of said roll of plastic is used as a first superstrate, wherein a second portion of said roll of plastic is used as a second superstrate.

14. The process as recited in claim 10, wherein said substrate is a roll of plastic.

15. The process as recited in claim 14, wherein said substrate is held against a vacuum or a porous chuck.

16. The process as recited in claim 14, wherein said substrate is more rigid than said superstrate.

17. The process as recited in claim 14, wherein a ratio of an effective bending rigidity of substrate to said superstrate exceeds 5.

18. The process as recited in claim 1, wherein said superstrate comprises fused silica wafers, wherein an outer ring of said wafers has a higher thickness in comparison to an inner ring of said wafers which interacts with said drops of said pre-cursor liquid organic material.

19. The process as recited in claim 1 further comprising:

depositing multi-material stacks on said substrate by using different inkjettable materials.

20. The process as recited in claim 19, wherein a set of inkjet nozzles deposits said multi-material stacks on said substrate, wherein one or more inkjet nozzles in said set of inkjet nozzles have a different material.

21. The process as recited in claim 1, wherein said superstrate has an effective bending rigidity with an optimal range defined by being higher than a minimum required to create merging of said drops while lower than a maximum required to ensure that said contiguous film does not equilibrate prior to a designed duration of time following said bringing down of said superstrate.

22. The process as recited in claim 21, wherein a pre-equilibrium transient of said contiguous film creates a film thickness profile whose volume distribution is a function of a volume distribution of said drops dispensed on said substrate.

23. The process as recited in claim 1, wherein a location and a volume of said dispensed drops on said substrate are obtained by solving an inverse optimization to minimize a norm of error between an actual film thickness profile and a desired film thickness profile.

24. The process as recited in claim 23, wherein said inverse optimization includes discrete variables associated with drop volumes and/or drop locations.

25. The process as recited in claim 1 further comprising:

etching said polymer film to allow a transfer of a film thickness profile to an underlying functional film or said substrate.

26. The process as recited in claim 1, wherein a minimum volume of drops dispensed is below 5 picoliters using either piezo jets or electro hydro dynamic jets.

27. The process as recited in claim 1, wherein a minimum volume of drops dispensed is below 1 picoliter using either piezo jets or electro hydro dynamic jets.

28. A process for depositing intentionally non-uniform films, the process comprising:

obtaining a desired non-uniform film thickness profile;

solving an inverse optimization program to obtain a volume and a location of dispensed drops so as to minimize a norm of error between said desired non-uniform film thickness profile and a final film thickness profile such that a volume distribution of said final film thickness profile is a function of said volume and said location of said dispensed drops;

dispensing said drops of a pre-cursor liquid organic material at a plurality of locations on a substrate by an array of inkjet nozzles;

bringing down a superstrate to form a contiguous film captured between said substrate and said superstrate;

enabling a non-equilibrium transient state of said superstrate, said contiguous film and said substrate to occur after a duration of time given by said inverse optimization scheme;

curing said contiguous film to solidify it into a polymer; and

separating said superstrate from said polymer thereby leaving a polymer film on said substrate.

29. The process as recited in claim 28, wherein said process is used for polishing a topography of said substrate.

30. The process as recited in claim 29, wherein said desired non-uniform film thickness profile is designed to compensate said topography of said substrate.

31. The process as recited in claim 28, wherein said desired non-uniform film thickness profile is given by a desired surface profile on said substrate and a starting substrate measured topography.

32. The process as recited in claim 31, wherein said process is used for compensating process parasitics comprising one or more of the following: evaporation, shrinkage and etch back.

33. The process as recited in claim 28, wherein said desired non-uniform film thickness profile compensates for imperfections in a shape of said substrate.

34. The process as recited in claim 33, wherein said shape of said substrate is a planar shape.

35. The process as recited in claim 33, wherein said shape of said substrate is a non-planar shape.

36. The process as recited in claim 33, wherein said process is used for compensating process parasitics comprising one or more of the following: evaporation, shrinkage and etch back.

Claims:

1. A process for depositing thin films, the process comprising:

dispensing drops of a pre-cursor liquid organic material at a plurality of locations on a substrate by an array of inkjet nozzles;

bringing down a superstrate thereby allowing said drops to form a contiguous film captured between said substrate and said superstrate;

selecting parameters of said superstrate to enable increased time to an equilibrium state thereby enabling capture of non-equilibrium transient states of said superstrate, said contiguous film and said substrate;

curing said contiguous film to solidify it into a solid; and

separating said superstrate from said solid thereby leaving a polymer film on said substrate.

2. The process as recited in claim 1 further comprising:

bringing down said superstrate that has been bowed due to a backside pressure such that a first contact on said drops is made by a front side of said superstrate thereby initiating a liquid front that spreads outward merging with said drops to form said contiguous film.

3. The process as recited in claim 2 further comprising:

bringing down said superstrate such that said first contact on said drops is made by said front side of said superstrate in a local atmosphere of gases that are soluble in organic liquids.

4. The process as recited in claim 2 further comprising:

bringing down said superstrate such that said first contact on said drops is made by said front side of said superstrate in a local atmosphere of helium or carbon dioxide.

5. The process as recited in claim 1, wherein said superstrate is porous and allows trapped gases to be transmitted.

6. The process as recited in claim 1, wherein said superstrate comprises a material of glass, ceramics, polymers or combinations thereof.

7. The process as recited in claim 1, wherein a surface of said superstrate is coated with a low surface energy coating, wherein a surface of said substrate is coated with an adhesion promoter.

8. The process as recited in claim 1, wherein said contiguous film is cured by photonic or thermal energy to solidify said contiguous film into said polymer.

9. The process as recited in claim 1, wherein said contiguous film is cured by exposure to ultraviolet radiation through said substrate or said superstrate.

10. The process as recited in claim 1, wherein said superstrate is a roll of plastic held under tension.

11. The process as recited in claim 10, wherein said substrate is composed of a material with a Young's modulus greater than 1 GPa.

12. The process as recited in claim 10, wherein said substrate is a rigid wafer composed of one or more of the following materials: silicon, silicon dioxide and gallium nitride.

13. The process as recited in claim 10, wherein a first portion of said roll of plastic is used as a first superstrate, wherein a second portion of said roll of plastic is used as a second superstrate.

14. The process as recited in claim 10, wherein said substrate is a roll of plastic.

15. The process as recited in claim 14, wherein said substrate is held against a vacuum or a porous chuck.

16. The process as recited in claim 14, wherein said substrate is more rigid than said superstrate.

17. The process as recited in claim 14, wherein a ratio of an effective bending rigidity of substrate to said superstrate exceeds 5.

18. The process as recited in claim 1, wherein said superstrate comprises fused silica wafers, wherein an outer ring of said wafers has a higher thickness in comparison to an inner ring of said wafers which interacts with said drops of said pre-cursor liquid organic material.

19. The process as recited in claim 1 further comprising:

depositing multi-material stacks on said substrate by using different inkjettable materials.

20. The process as recited in claim 19, wherein a set of inkjet nozzles deposits said multi-material stacks on said substrate, wherein one or more inkjet nozzles in said set of inkjet nozzles have a different material.

21. The process as recited in claim 1, wherein said superstrate has an effective bending rigidity with an optimal range defined by being higher than a minimum required to create merging of said drops while lower than a maximum required to ensure that said contiguous film does not equilibrate prior to a designed duration of time following said bringing down of said superstrate.

22. The process as recited in claim 21, wherein a pre-equilibrium transient of said contiguous film creates a film thickness profile whose volume distribution is a function of a volume distribution of said drops dispensed on said substrate.

23. The process as recited in claim 1, wherein a location and a volume of said dispensed drops on said substrate are obtained by solving an inverse optimization to minimize a norm of error between an actual film thickness profile and a desired film thickness profile.

24. The process as recited in claim 23, wherein said inverse optimization includes discrete variables associated with drop volumes and/or drop locations.

25. The process as recited in claim 1 further comprising:

etching said polymer film to allow a transfer of a film thickness profile to an underlying functional film or said substrate.

26. The process as recited in claim 1, wherein a minimum volume of drops dispensed is below 5 picoliters using either piezo jets or electro hydro dynamic jets.

27. The process as recited in claim 1, wherein a minimum volume of drops dispensed is below 1 picoliter using either piezo jets or electro hydro dynamic jets.

28. A process for depositing intentionally non-uniform films, the process comprising:

obtaining a desired non-uniform film thickness profile;

solving an inverse optimization program to obtain a volume and a location of dispensed drops so as to minimize a norm of error between said desired non-uniform film thickness profile and a final film thickness profile such that a volume distribution of said final film thickness profile is a function of said volume and said location of said dispensed drops;

dispensing said drops of a pre-cursor liquid organic material at a plurality of locations on a substrate by an array of inkjet nozzles;

bringing down a superstrate to form a contiguous film captured between said substrate and said superstrate;

obtaining a time to a non-equilibrium transient state of said superstrate, said contiguous film and said substrate by using said inverse optimization scheme;

curing said contiguous film to solidify it into a polymer; and

separating said superstrate from said polymer thereby leaving a polymer film on said substrate.

29. The process as recited in claim 28, wherein said process is used for polishing a topography of said substrate.

30. The process as recited in claim 29, wherein said desired non-uniform film thickness profile is designed to compensate said topography of said substrate.

31. The process as recited in claim 28, wherein said desired non-uniform film thickness profile is given by a desired surface profile on said substrate and a starting substrate measured topography.

32. The process as recited in claim 31, wherein said process is used for compensating process parasitics comprising one or more of the following: evaporation, shrinkage and etch back.

33. The process as recited in claim 28, wherein said desired non-uniform film thickness profile compensates for imperfections in a shape of said substrate.

34. The process as recited in claim 33, wherein said shape of said substrate is a planar shape.

35. The process as recited in claim 33, wherein said shape of said substrate is a non-planar shape.

36. The process as recited in claim 33, wherein said process is used for compensating process parasitics comprising one or more of the following: evaporation, shrinkage and etch back.