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— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*
— *of inventorship (Rule 4.17(iv))*

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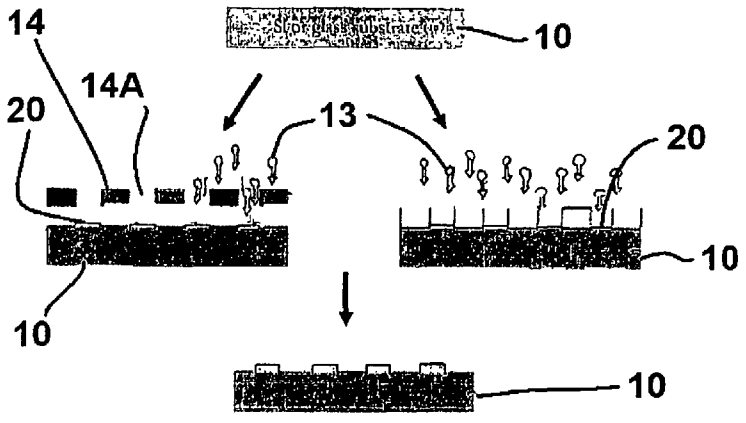
(54) Title: METHOD FOR PRODUCING CRYSTALS AND SCREENING CRYSTALLIZATION CONDITIONS



(57) Abstract: A method for producing crystals and for screening crystallization conditions of chemical materials on distinct metallic islands with specific functional groups, for preparing and screening the conditions necessary to promote a specific polymorph of a crystal, and a means for testing and screening the more precise conditions suitable for achieving a desired size or form of a crystal.

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— *with amended claims and statement*

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AMENDED CLAIMS
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What is Claimed is:

1. A method for the screening of crystallization conditions comprising the steps of:

a) nucleating and growing crystals of a selected substance on a substrate comprising functionalized metallic islands with multiple layers of self-assembled monolayers (SAMs); and

b) after the crystals have formed on the metallic islands, analyzing the crystals.

2. The method as claimed in Claim 1, wherein solution droplets containing the selected substance and having a defined size and shape are formed on the metallic islands by immersing the metallic islands into a solution bath containing the selected substance and withdrawing the metallic islands from the solution bath, wherein the solution bath contains an unsaturated, saturated or supersaturated solution of the selected substance.

3. The method as claimed in Claim 2, wherein the self-assembled monolayers (SAMs) comprise at least one functional group and the functional group is selected to create a preferential bond between the metallic island and the solution droplets.

4. The method as claimed in Claim 3, wherein the solution droplet becomes a supersaturated solution.

5. The method as claimed in Claim 4, wherein the solution droplet becomes a supersaturated solution by a supersaturation method selected from the group consisting of evaporation, antisolvent addition, vapor diffusion, oil diffusion, and heating and cooling.

6. The method as claimed in Claim 1, wherein the preparation of crystal is accomplished in a micro-scale, high throughput manner comprising the steps of:

a) preparing a bifunctional substrate with the metallic islands and multiple layers of self-assembled monolayers (SAMs) having desired chemical functional groups; and

b) preparing the crystals from solution droplets on the metallic islands on the substrate,

wherein the metallic islands are prepared so that solution droplets preferentially wet the metallic islands.

7. The method as claimed in Claim 6, wherein the bifunctional substrate is prepared by a method comprising the steps of:

a) depositing a metal layer onto a surface of the substrate so to create the metallic islands of the deposited metal;

b) depositing a first layer of the self-assembled monolayer (SAMs) with the a desired chemical functional group onto the metallic islands; and

c) depositing a second layer of the SAMs with another chemical functional group for use as backfill substrate onto the metallic islands.

8. The method as claimed in Claim 7, wherein the metal layer is deposited onto the substrate using a metal evaporation process.

9. The method as claimed in Claim 8, wherein a metal adlayer is first deposited onto the substrate to promote adhesion between the metal layer and substrate.

10. The method as claimed in Claim 9, wherein the metal suitable for use as the metal layer is selected from the group consisting of gold, silver titanium, platinum, nickel, copper, palladium, and combinations thereof.

11. The method as claimed in Claim 10, wherein the metal adlayer is selected from the group consisting of titanium and chromium, which are deposited onto the substrate using an electron beam evaporator.

12. The method as claimed in Claim 9, wherein the method for depositing the metal layer onto the substrate incorporates a means selected from the group consisting of a mesh and a photoresist polymer.

13. The method as claimed in Claim 7, wherein once the metallic islands have been revealed on the substrate, a multiple layer pattern is deposited on the substrate by subsequent immersions in surfactant materials.

14. The method as claimed in Claim 13, wherein the substrate is first immersed into a first surfactant material so to create a homogeneous self-assembled monolayer with a specific chemical functional head group formed on the metallic islands.

15. The method as claimed in Claim 14, wherein subsequently the substrate is soaked in a second surfactant material so to provide the back fill-in for the metallic islands.

16. The method as claimed in Claim 15 wherein the first surfactant preferentially binds to the metallic islands of the substrate.

17. The method as claimed in Claim 1, wherein the crystal is prepared on the metallic islands from solution droplets under a set of defined parameters selected from the group consisting of the size of the metallic island, the structure of the metallic island, and the solution concentration.

18. The method as claimed in Claim 17, wherein the conditions for crystallization are selected to promote a specific form or size of crystal.

19. The method as claimed in Claim 3, wherein the crystal form is controlled by a chemical process selected from the group consisting of varying the rate of supersaturation, varying incubation temperature, varying the concentration of droplet solution, and varying the chemical functionality of the SAMs.

20. The method as claimed in Claim 1, wherein solution droplets of the selected substance are deposited upon the metallic islands by immersion of the substrate into a crystallite solution.

21. The method as claimed in Claim 20, wherein the solution droplets are placed on the metallic islands of the substrate by immersing and soaking the substrate in the crystallite solution.

22. The method as claimed in Claim 21, wherein the substrate is slowly withdrawn from the solution such that the solution droplets wet the metallic islands whereby the solution droplets with defined size and shape are formed on the metallic islands.

23. The method as claimed in Claim 22, wherein the solution droplets contain both seeds crystallized material and solvent so to improve crystallization rates.

24. The method as claimed in Claim 1, wherein the crystals are analyzed without removing the crystals from the metallic islands.

25. The method as claimed in Claim 24, wherein the size, morphology, and crystal form is analyzed by a techniques selected from the group consisting of optical microscopy, electronic microscopy, Raman microscopy, single crystal x-ray diffraction, powder x-ray diffraction, particle analyzers, and thermal analysis.

26. The method as claimed in Claim 1, wherein from 200 to 80,000 metallic islands are contained on a single substrate.

27. A method for the screening of crystallization conditions comprising the steps of first nucleating and growing crystals of a selected substance on functionalized metallic islands on a substrate and then after the crystals have formed on the metallic islands, analyzing the crystals without removing the crystals from the metallic islands, wherein:

a) supersaturated solution droplets containing the selected substance and having a defined size and shape are formed on the metallic islands by immersing the metallic islands into a solution bath containing the selected substance and withdrawing the metallic islands from the solution bath, wherein the solution bath contains an unsaturated, saturated or supersaturated solution of the selected substance; and

b) the metallic islands are formed using self-assembled monolayers (SAMs) comprising at least one functional group and the functional group is selected to create a preferential bond between the metallic island and the solution droplets.

28. The method as claimed in Claim 27, wherein the substrate is prepared by a method comprising the steps of:

a) depositing a metal layer onto a surface of the substrate so to create the metallic islands of the deposited metal;

b) depositing a first layer of the self-assembled monolayer (SAMs) with the a desired chemical functional group onto the metallic islands; and

c) depositing a second layer of the SAMs with another chemical functional group for use as backfill substrate onto the metallic islands.

29. The method as claimed in Claim 28, wherein the metal suitable for use as the metal layer is selected from the group consisting of gold, silver titanium, platinum, nickel, copper, palladium, and combinations thereof.

30. The method as claimed in Claim 29, wherein a metal adlayer is first deposited onto the substrate to promote adhesion between the metal layer and substrate.

31. The method as claimed in Claim 30, wherein the metal adlayer is selected from the group consisting of titanium and chromium, which are deposited onto the substrate using an electron beam evaporator.

32. The method as claimed in Claim 29, wherein the method for depositing the metal layer onto the substrate incorporates a means selected from the group consisting of a mesh and a photoresist polymer.

33. The method as claimed in Claim 32, wherein once the metallic islands have been revealed on the substrate, a multiple layer pattern is deposited on the substrate by subsequent immersions in surfactant materials.

34. The method as claimed in Claim 27, wherein the substrate is first immersed into a first surfactant material so to create a homogeneous self-assembled monolayer with a specific chemical functional head group formed on the metallic islands, and then the substrate is soaked in a second surfactant material so to provide the back fill-in for the metallic islands,

wherein the first surfactant preferentially binds to the metallic islands of the substrate.

35. The method as claimed in Claim 27, wherein the crystal is prepared on the metallic islands from solution droplets under a set of defined parameters selected from the group consisting of the size of the metallic island, the structure of the metallic island, and the solution concentration.

36. The method as claimed in Claim 27, wherein the conditions for crystallization are selected to promote a specific form or size of crystal.

37. The method as claimed in Claim 27, wherein the crystal form is controlled by a chemical process selected from the group consisting of varying the rate of supersaturation, varying incubation temperature, varying the concentration of droplet solution, and varying the chemical functionality of the SAMs.

38. The method as claimed in Claim 27, wherein the solution droplets contain both seeds crystallized material and solvent so to improve crystallization rates.

39. The method as claimed in Claim 27, wherein the size, morphology, and crystal form is analyzed by a techniques selected from the group consisting of optical microscopy, electronic microscopy, Raman microscopy, single crystal x-ray diffraction, powder x-ray diffraction, particle analyzers, and thermal analysis.

40. The method as claimed in Claim 27, wherein from 200 to 80,000 metallic islands are contained on a single substrate.

41. The method as claimed in Claim 27, wherein at least one of the multiple layers comprises a silane and a functional group.

42. The method as claimed in Claim 27, wherein at least one of the multiple layers comprises thiols and has a functional group.

43. The method as claimed in Claim 27, wherein the functional group is selected from the group consisting of carboxyl, hydroxyl (OH), nitro (NO_2), sulfonic acid (SO_3^-), and phosphonic acid ($-PO_4^-$).

44. The method as claimed in Claim 27, wherein the functional group is selected from the group consisting of methyl (CH_3), trifluoromethyl (CF_3), halogenated fluorine, halogenated chlorine, halogenated bromine, and halogenated iodine.

45. The method as claimed in Claim 27, wherein the method is carried out at a constant room temperature.

Statement under Article 19(1)

Claim 1 has been amended to clarify that the metallic islands are functionalized through the use of SAMs by incorporating subject matter from Claim 3.

Claim 3 has been amended to remove the subject matter incorporated into Claim 1.

No other claims have been amended.

Substitute pages incorporating these amendments are attached hereto.