Claims:

1. A device comprising:

a volume including a ferroelectric nematic liquid crystal having an electric polarization density field throughout the volume; and

a surface in contact with the volume at an interface, that imparts a favored surface polarity of molecules of the liquid crystal;

wherein the favored surface polarity causes the electric polarization density field to form a monodomain having a vectorially uniform orientation throughout the volume.

2. The device of claim 1, further comprising:

an additional surface, in contact with the volume at an additional interface, that imparts an additional favored surface polarity of the molecules;

wherein the additional favored surface polarity controls an additional vectorial orientation of the electric polarization density field.

3. The device of claim 2, wherein the additional surface is configured to impart an additional favored surface polarity of the molecules to control a vectorial orientation of the electric polarization density field within the volume .

4. The device of claim 1, the surface having been treated by one or more of unidirectional buffing, oblique photoalignment, oblique illumination, oblique etching, or oblique material deposition, such that the favored surface polarity of the molecules comprises a component locally normal to and directed away from the surface.

5. The device of claim 1, the surface having been treated by one or more of unidirectional buffing, oblique photoalignment, oblique illumination, oblique etching, or oblique material deposition, such that the favored surface polarity of the molecules comprises a component locally normal to and directed toward the surface.

6. The device of claim 1, wherein the favored surface polarity of the molecules comprises a component locally tangent to the surface.

7. The device of claim 6, wherein said component comprises a unique favored azimuthal orientation about a surface-normal to the surface.

8. The device of claim 1, wherein the favored surface polarity of the molecules comprises a component created by unidirectional buffing of the surface.

9. The device of any of claims 1-7, wherein the favored surface polarity of the molecules is created using an oblique illumination of a surface of the one or more surfaces by an electromagnetic wave.

10. The device of any of claims 1-7, wherein the favored surface polarity of the molecules comprises a component created via photo-polymerization induced by illumination of a surface of the one or more surfaces.

11. The device of any of claims 1-7, wherein the favored surface polarity of the molecules comprises a component created via photo-polymerization induced by illumination of a surface of the one or more surfaces, where said illumination is oblique.

12. The device of any of claims 1-7, wherein the favored surface polarity of the molecules comprises a component created via photo-degradation induced by illumination of a surface of the one or more surfaces.

13. The device of any of claims 1-7, wherein the favored surface polarity of the molecules comprises a component created by deposition of material onto a surface of the one or more surfaces.

14. The device of any of claims 1-7, wherein the favored surface polarity of the molecules comprises a component created by deposition of material onto a surface of the one or more surfaces, where said deposition is oblique.

15. The device of any of claims 1-7, wherein the favored surface polarity of the molecules comprises a component created by etching of material from the one or more materials.

16. The device of any of claims 1-7, wherein the favored surface polarity of the molecules comprises a component created by etching of material from the one or more materials, where said etching is oblique.

17. The device of any of claims 1-16, further comprising:
one or more electrical connections to apply an electric field to the volume.

18. The device of any of claims 1-13, further comprising:
an apparatus to apply an electromagnetic field to the volume.

19. A method for controlling a favored vectorial orientation in three dimensions of a polarization field of a ferroelectric nematic liquid crystal at an interfacial surface with a material or materials, the method comprising:

providing a first material having a first surface in contact with a volume including the ferroelectric nematic liquid crystal having an electric polarization density field throughout the volume; and

using the first surface, imparting a favored surface polarity of molecules of the ferroelectric nematic liquid crystal, said favored surface polarity causes the electric polarization density field to form a monodomain having a vectorially uniform orientation throughout the volume.

20. The method of claim 19, further providing a second material having a second surface in contact with the volume.

21. The method of claim 19 , the first surface having been treated by one or more of unidirectional buffing, oblique photoalignment, oblique illumination, oblique etching, or oblique material deposition, such that the favored surface polarity of the molecules

comprises a component locally normal to the first surface and directed toward the first surface.

22. The method of claim 19, the first surface having been treated by one or more of unidirectional buffing, oblique photoalignment, oblique illumination, oblique etching, or oblique material deposition, such that the favored surface polarity of the molecules comprises a component locally normal to the first surface and directed away from the first surface.

23. The method of any of claims 19-22, wherein the favored surface polarity of the molecules comprises a component locally tangent to the first surface.

24. The method of claim 23, wherein said component comprises a unique favored azimuthal orientation about the surface normal.

25. The method of any of claims 19-24, wherein the favored surface polarity of the molecules comprises a component created by unidirectional buffing of the first surface.

26. The method of any of claims 19-24, wherein the favored surface polarity of the molecules comprises a component created using an oblique illumination of the first surface by an electromagnetic wave.

27. The method of any of claims 19-24, wherein the favored surface polarity of the molecules comprises a component created via photo-polymerization induced by oblique illumination of the first surface.

28. The method of any of claims 19-24, wherein the favored surface polarity of the molecules comprises a component created via photo-degradation induced by oblique illumination of the first surface.

29. The method of any of claims 19-24, wherein the favored surface polarity of the molecules comprises a component created by oblique deposition of material onto the first surface.

30. The method of any of claims 19-24, wherein the favored surface polarity of the molecules comprises a component created by oblique etching of material from the first surface.

31. The method of any of claims 19-30, wherein said contact of the first surface to the volume is made at a first temperature phase and the volume is cooled into the ferroelectric nematic phase at a second temperature.

32. The method of claim 31, wherein the volume comprises a nematic phase at the first temperature.

33. The method of claim 31 or claim 32, wherein the volume comprises an isotropic material at the first temperature.

34. The method of any of claims 19-33, wherein the volume comprises a ferroelectric nematic phase.

35. The method of any of claims 19-34, wherein interfacial control is employed to establish the polar vectorial orientation in three dimensions of a spontaneous polarization field in the volume of a ferroelectric nematic liquid crystal.

36. A method of forming a ferroelectric nematic liquid crystal device, the method comprising:

providing a volume including a ferroelectric nematic liquid crystal;

providing a first material comprising a first surface in contact with the volume; and

imparting a favored surface polarity of molecules of the liquid crystal, wherein said favored surface polarity causes the electric polarization density field to form a monodomain having a vectorially uniform orientation throughout the volume.

37. The method of claim 36, wherein interfacial control establishing a polar vectorial orientation in three dimensions of a spontaneous polarization field in the volume of a ferroelectric nematic liquid crystal is achieved upon cooling the volume of liquid crystal from a higher temperature phase to a ferroelectric nematic liquid crystal phase.

38. The method of claim 37, where the higher temperature phase is a nonferroelectric nematic phase.

39. The method of claim 37 or claim 38, wherein said cooling is configured to maintain a temperature gradient within the liquid crystal during cooling into the ferroelectric nematic phase.

40. The method of claim 37 or claim 38, wherein said cooling is configured to maintain a temperature gradient within the liquid crystal during cooling into the ferroelectric nematic phase, said gradient enabling the ferroelectric nematic phase to form first on selected surfaces.

41. A method as in any one of claims 19-34, further comprising a step of applying an electric field to said ferroelectric nematic phase.

42. Devices and methods of claims 1- 41, further comprising dopant molecules dissolved in the ferroelectric nematic phase.

43. Devices and methods of claim 42, wherein the dopant molecules have dipole moments, said dipole moments being preferentially aligned by the vectorial orientation field of the FNLC adjacent to or in their vicinity.

44. Devices and methods of claims 1-43, wherein said ferroelectric nematic phase is a mixture of two or more distinct molecular species.

45. Devices and methods of claims 44, wherein said ferroelectric nematic phase is a eutectic mixture.

46. Devices and methods of claims 1-45, wherein the volume vectorial orientation of said FNLC forms an orientational glass as the temperature is lowered.