CLAIMS

WHAT IS CLAIMED IS:

1. A method for processing an analyte, comprising:

(a) providing a fluidic device comprising (i) said analyte, (ii) one or more polymer precursors, and (iii) a spatial energy modulating element;

(b) identifying a discrete area within said fluidic device, wherein said discrete area comprises said analyte; and

(c) selectively supplying a unit of energy generated from said energy source to said fluidic device to generate a polymer matrix from said one or more polymer precursors within said fluidic device,

wherein said polymer matrix is within said discrete area in (b) or adjacent to said discrete area in (b).

2. The method of claim 1, wherein said fluidic device comprises a flow channel.

3. The method of claim 1, wherein said fluidic device comprises an open configuration.

4. The method of claim 1, wherein said fluidic device contains one or more discrete locations, and wherein said one or more discrete locations are not in fluidic communication with another discrete location.

5. The method of claim 4, wherein said one or more discrete locations are one or more well plates.

6. The method of claim 4, wherein said one or more discrete locations are open at the top.

7. The method of claim 4, wherein said one or more discrete locations comprise said analyte.

8. The method of claim 1, wherein said fluidic device further comprises one or more monomers.

9. The method of claim 1, wherein said fluidic device comprises a surface having a capture probe immobilized thereto, wherein said capture probe couples to said analyte to immobilize said analyte to said surface.

10. The method of claim 1, wherein said polymer matrix is generated adjacent to or surrounding said analyte to immobilize said analyte.

11. The method of claim 1, wherein said polymer matrix forms a hydrogel.

12. The method of claim 9, wherein said capture probe comprises one or more functional groups capable of interacting with said analyte.

13. The method of claim 12, wherein said one or more functional groups comprise a complementary DNA sequence to target DNA or RNA.

14. The method of claim 1, wherein said energy source is in optical communication with said fluidic device.

15. The method of claim 1, wherein said energy source is a light generating device.

16. The method of claim 15, wherein said light generating device generates light at 350 nm to 800 nm.

17. The method of claim 15, wherein said light generating device generates light at 350 nm to 600 nm.

18. The method of claim 15, wherein said light generating device generates light at 350 nm to 450 nm.

19. The method of claim 15, wherein said light generating device generates UV light.

20. The method of claim 1, wherein said spatial energy modulating element comprises a spatial light modulator (SLM), and wherein (d) is performed using said SLM.

21. The method of claim 20, wherein said SLM is a digital micromirror device (DMD).

22. The method of claim 20, wherein said SLM is a laser beam steered using a galvanometer.

23. The method of claim 20, wherein said SLM is liquid-crystal based.

24. The method of claim 1, wherein an area of said discrete area is less than an area of said fluidic device.

25. The method of claim 1, wherein said analyte is captured within said discrete area.

26. The method of claim 1, wherein said size and shape of said discrete area is adjustable according to a shape of said analyte, a shape of said analyte, or other properties of said analyte.

27. The method of claim 26, wherein an algorithm is used to determine said shape and size of said discrete area.

28. The method of claim 27, wherein said algorithm is a supervised, a self-supervised, or an unsupervised learning algorithm.

29. The method of claim 1, wherein said identifying in (b) is performed optically.

30. The method of claim 1, wherein said identifying in (b) is performed using a detector configured to detect a location of said analyte within said fluidic device.

31. The method of claim 30, wherein said detector configured to detect said location of said analyte within said fluidic device is a microscope objective for imaging said fluidic device.

32. The method of claim 31, wherein an algorithm is used to determine where said analyte is located based on said imaging.

33. The method of claim 31, wherein said imaging is bright-field imaging, phase-contrast imaging, or fluorescence imaging, or any combination thereof.

34. The method of claim 32, wherein said algorithm is a supervised, a self-supervised, or an unsupervised learning algorithm.

35. The method of claim 31, wherein said objective is coupled to an energy source to emit energy to said discrete area in said fluidic device.

36. The method of claim 1, further comprising introducing one or more reagents to said polymer matrix that react with said analyte.

37. The method of claim 36, wherein said one or more reagents flow through a membrane.

38. The method of claim 37, wherein said membrane is semi-permeable.

39. The method of claim 37, wherein said membrane comprises pores.

40. The method of claim 39, wherein said pores are less than 10 um.

41. The method of claim 36, wherein said one or more reagents is an enzyme, a drug molecule, oligonucleotide, primer, or any combination thereof.

42. The method of claim 36, wherein said one or more reagents is a lysis reagent.

43. The method of claim 36, wherein said one or more reagents is a nucleic acid denaturation reagent.

44. The method of claim 36, wherein said one or more reagents degrades said polymer matrix.

45. The method of claim 1, wherein said analyte is a component of a cell.

46. The method of claim 45, wherein said analyte is a small molecule composed of nucleic acids, amino acids, intracellular proteins, surface proteins, secreted proteins, exosomes, metabolites or lipids, or any combination thereof.

47. The method of claim 9, wherein said capture probe is located within said polymer matrix.

48. The method of claim 9, wherein said capture probe is located on a surface of said polymer matrix.

49. The method of claim 45, wherein said analyte is released from said cell upon interaction with a reagent.

50. The method of claim 49, wherein said reagent is an oxidative or a reducing agent.

51. The method of claim 49, wherein said reagent is an organic or inorganic molecule.

52. The method of claim 51, wherein said organic or inorganic molecule is a pharmaceutical compound or detergent.

53. The method of claim 49, wherein said reagent is a protein.

54. The method of claim 49, wherein said reagent is a DNA aptamer.

55. The method of claim 49, wherein said reagent is a bead carrying biomolecules.

56. The method of claim 49, wherein said reagent is a biological species.

57. The method of claim 56, wherein said biological species is a virus or cell.

58. The method of claim 45, wherein said analyte is released from said cell upon exposure to an energy source.

59. The method of claim 58, wherein said energy source is UV light for lysing cells.

60. The method of claim 58, wherein said energy source is visible light for lysing cells.

61. The method of claim 59, wherein said UV light is used to activate a photoactivated detergent and lyse said cell.

62. The method of claim 60, wherein said visible light is used to activate a photoactivated detergent and lyse said cell.

63. The method of claim 1, further comprising identifying said analyte or a component thereof.

64. The method of claim 63, wherein said analyte is a nucleic acid, amino acid, intracellular protein, surface protein, secreted protein, exosome, metabolite or lipid, or any combination thereof.

65. The method of claim 63, wherein said analyte is a nucleic acid molecule, and wherein said identifying comprises sequencing said nucleic acid molecule or a component thereof.

66. The method of claim 1, further comprising measuring a quality of said analyte or a component thereof.

67. The method of claim 66, wherein said quality is a shape or size of said analyte or a component thereof.

68. The method of claim 1, further comprising performing one or more functional assays on said analyte or a component thereof.

69. The method of claim 68, wherein said one or more functional assays assess cell viability, cell morphology, cell secretions, cell responses, intercellular interactions, or any combination thereof.

70. The method of claim 68, wherein said one or more functional assays is a colorimetric assay or fluorescent assay.

71. The method of claim 68, wherein said one or more functional assays are performed using bright-field phase contrast or fluorescent imaging of said analyte.

72. The method of claim 1, further comprising performing one or more omics assays to characterize and quantify said analyte or a component thereof.

73. The method of claim 72, wherein said one or more omics assays is a proteomic, transcriptomic, genomic, or epigenomic assay, or any combination thereof.

74. The method of claim 72, wherein said one or more omics assays is a multi-omic assay.