CLAIMS

What is claimed is:

1. An apparatus, comprising:

a system, comprising:

a reagent cartridge receptacle;

an illumination assembly comprising an illumination source to emit an illumination light;

a sensor; and

a processor;

a reagent cartridge receivable within the reagent cartridge receptacle, the reagent cartridge, comprising:

a well assembly, comprising:

a body defining a well and having an opening, an aperture, and a field of view (FOV) enabling optical access from the aperture to the well;

reagent contained within the well; and

a cover coupled to the body and covering the opening;

wherein the illumination assembly is positioned to direct the illumination light through the aperture and the sensor is positioned to capture light.

2. The apparatus of claim 1, wherein a membrane is coupled to a surface of the body and a fluidic line is defined between the membrane and the body, further comprising a membrane valve that selectively controls a flow of liquid between the well and the fluidic line.

3. The apparatus of claim 2, wherein the membrane defines an opening aligned with the aperture.

4. The apparatus of any one of the preceding claims, wherein the body comprises an inner portion and an outer portion and wherein the inner portion is substantially transparent and comprises the aperture, and the outer portion is substantially opaque.

~~5. The apparatus of claim 4, wherein the inner portion is substantially transparent and comprises the aperture, and the outer portion being substantially opaque.~~

~~6. The apparatus of claim 4, wherein the light captured by the sensor comprises one or more of reflective light, emissive light, or the illumination light emitted by the illumination assembly and the inner portion is substantially transparent to one or more of at least the reflective light, the emissive light, or the illumination light.~~

~~7. The apparatus of claim 4, wherein the inner portion comprises Cyclic Olefin Copolymer (COC) and the outer portion comprises Polypropylene.~~ ~~8~~5. The apparatus of

claim 4, wherein the inner portion comprises a flange and the outer portion is overmolded over the flange.

~~9~~6. The apparatus of claim 4, wherein the outer portion comprises a tapered surface that redirects the FOV toward the well.

~~10~~7. The apparatus of claim ~~9~~6, wherein the reagent within the well is within the FOV.

~~11~~8. The apparatus of claim ~~9~~6, wherein the inner portion comprises a second aperture and the outer portion comprises a second tapered surface that redirects the FOV toward the second aperture.

~~12~~9. The apparatus of claim ~~11~~8, wherein a headspace within the well is within the FOV.

~~13~~10. The apparatus of claim ~~11~~8, wherein the body comprises a base that includes the aperture and the second aperture.

~~14~~11. The apparatus of claim ~~11~~8, wherein a central axis of the aperture and a central axis of the second aperture are substantially parallel.

~~15~~12. The apparatus of claim 4, wherein the inner portion and the outer portion are concentric.

~~16~~13. The apparatus of claim 4, wherein the inner portion comprises a second aperture and wherein the outer portion comprises a first tapered surface and a portion of the body defining the well comprises a second tapered surface, the first tapered surface and the second tapered surface redirecting the FOV between the aperture and the second aperture.

~~17~~14. The apparatus of claim ~~16~~13, wherein the first tapered surface opposes the second tapered surface.

~~18~~15. The apparatus of claim 4, wherein the inner portion comprises a second aperture and a portion of the body defining the well comprises a tapered surface that redirects the FOV between the aperture and the second aperture.

~~19~~16. The apparatus of claim 1, wherein the sensor generates illumination data using the light captured and the processor processes the illumination data to determine a parameter value associated with the reagent contained within the well and wherein the parameter value comprises at least one of a moisture content value, an oxygen content value, or a concentration value of at least one component of the reagent.

~~20. The apparatus of claim 19, wherein the parameter value comprises a moisture content value.~~

~~21. The apparatus of claim 19, wherein the parameter value comprises an oxygen content value.~~

~~22. The apparatus of claim 19, wherein the parameter value comprises a concentration value of at least one component of the reagent.~~

~~23. The apparatus of claim 1, wherein the reagent comprises a dry reagent.~~

~~24. The apparatus of claim 1, wherein the reagent comprises a rehydrated reagent.~~

~~25. The apparatus of claim 1, wherein the reagent cartridge comprises a liquid reservoir containing a liquid.~~

~~26. The apparatus of claim 1, wherein the light captured by the sensor is less than all of the illumination light emitted by the illumination assembly.~~

~~27. The apparatus of claim 1, wherein the light captured by the sensor comprises one or more of reflective light, emissive light, or the illumination light emitted by the illumination assembly.~~

~~28~~17. An apparatus, comprising:

a body defining a well and having an opening, an aperture, and a field of view (FOV) enabling optical access from the aperture to the well;

dry reagent contained within the well; and

a cover coupled to the body and covering the opening.

~~29~~18. The apparatus of claim ~~28~~17, wherein the body comprises a second aperture having a central axis that is substantially orthogonal to a central axis of the aperture and wherein a portion of the body defining the well comprises a tapered surface that redirects the FOV between the aperture and the second aperture.

~~30. The apparatus of claim 28, further comprising a venting membrane coupled to the body and covering the dry reagent.~~

~~31. The apparatus of claim 30, wherein the body comprises an internal step and the venting membrane is coupled to the internal step.~~

~~32. The apparatus of claim 30, wherein the venting membrane is positioned between the dry reagent and the cover.~~

~~33. The apparatus of claim 28, wherein the aperture comprises a flat exterior surface of the well.~~

~~34. The apparatus of claim 28, wherein the cover comprises an impermeable barrier.~~

~~35. The apparatus of claim 34, wherein the impermeable barrier comprises foil.~~

~~36~~19. A method, comprising:

directing an illumination light through an aperture of a body of a well, the body having an opening, the aperture, and a field of view (FOV) enabling optical access from the aperture

to the well, a cover being coupled to the body and covering the opening and dry reagent being contained within the well;

capturing light; and

processing illumination data associated with the light to determine a parameter value associated with the dry reagent contained within the well.

~~37~~20. The method of claim ~~36~~19, further comprising redirecting the FOV and wherein redirecting the FOV comprises at least one of redirecting the FOV toward the well, redirecting the FOV toward a headspace within the well, redirecting the FOV toward the dry reagent, or redirecting the FOV toward a second aperture.

~~38. The method of claim 37, wherein redirecting the FOV comprises redirecting the FOV toward the well.~~

~~39. The method of claim 37, wherein redirecting the FOV comprises redirecting the FOV toward a headspace within the well.~~

~~40. The method of claim 37, wherein redirecting the FOV comprises redirecting the FOV toward the dry reagent.~~

~~41. The method of claim 37, wherein redirecting the FOV comprises redirecting the FOV toward a second aperture and wherein capturing the light comprises capturing the light at the second aperture.~~

~~42. The method of claim 36, wherein the parameter value comprises a moisture content value.~~

~~43. The method of claim 36, wherein the parameter value comprises an oxygen content value.~~

~~44. The method of claim 36, wherein the parameter value comprises a concentration value of at least one component of the dry reagent.~~

~~45. The method of claim 36, wherein capturing the light comprises capturing one or more of reflective light, emissive light, or the illumination light emitted by the illumination assembly.~~

~~46. The method of claim 36, wherein capturing the light comprises capturing less than all of the illumination light directed through the aperture.~~

~~47. An apparatus, comprising:~~

~~a body defining a well having an opening, an aperture, and a field of view (FOV) enabling optical access from the aperture to the well; and~~

~~a cover coupled to the body and covering the opening.~~

~~48. The apparatus of any one of claims 4 – 5, wherein the light captured by the sensor comprises one or more of reflective light, emissive light, or the illumination light~~

emitted by the illumination assembly and the inner portion is substantially transparent to one or more of at least the reflective light, the emissive light, or the illumination light.

49. The apparatus of any one of claims 4 – 6, wherein the inner portion comprises Cyclic Olefin Copolymer (COC) and the outer portion comprises Polypropylene.

50. The apparatus of any one of claims 4 – 7, wherein the inner portion comprises a flange and the outer portion is overmolded over the flange.

51. The apparatus of any one of claims 4 – 8, wherein the outer portion comprises a tapered surface that redirects the FOV toward the well.

52. The apparatus of any one of claims 9 – 10, wherein the inner portion comprises a second aperture and the outer portion comprises a second tapered surface that redirects the FOV toward the second aperture.

53. The apparatus of any one of claims 11 – 12, wherein the body comprises a base that includes the aperture and the second aperture.

54. The apparatus of any one of claims 11 – 13, wherein a central axis of the aperture and a central axis of the second aperture are substantially parallel.

55. The apparatus of any one of claims 4 – 14, wherein the inner portion and the outer portion are concentric.

56. The apparatus of any one of claims 4 – 15, wherein the inner portion comprises a second aperture and wherein the outer portion comprises a first tapered surface and a portion of the body defining the well comprises a second tapered surface, the first tapered surface and the second tapered surface redirecting the FOV between the aperture and the second aperture.

57. The apparatus of any one of claims 4 – 17, wherein the inner portion comprises a second aperture and a portion of the body defining the well comprises a tapered surface that redirects the FOV between the aperture and the second aperture.

58. The apparatus of any one of claims 1 – 18, wherein the sensor generates illumination data using the light captured and the processor processes the illumination data to determine a parameter value associated with the reagent contained within the well.

59. The apparatus of any one claims 1 – 22, wherein the reagent comprises a dry reagent.

60. The apparatus of any one of claims 1 – 23, wherein the reagent comprises a rehydrated reagent.

61. The apparatus of any one of claims 1 – 24, wherein the reagent cartridge comprises a liquid reservoir containing a liquid.

62. The apparatus of any one of claims 1 – 25, wherein the light captured by the sensor is less than all of the illumination light emitted by the illumination assembly.

~~63. The apparatus of any one of claims 1 – 26, wherein the light captured by the sensor comprises one or more of reflective light, emissive light, or the illumination light emitted by the illumination assembly.~~

~~64. The apparatus of any one of claims 28 – 29, further comprising a venting membrane coupled to the body and covering the dry reagent.~~

~~65. The apparatus of any one of claims 30 – 31, wherein the venting membrane is positioned between the dry reagent and the cover.~~

~~66. The apparatus of any one of claims 30 – 32, wherein the aperture comprises a flat exterior surface of the well.~~

~~67. The apparatus of any one of claims 28 – 33, wherein the cover comprises an impermeable barrier.~~

~~68. The method of any one of claims 36 – 38, wherein redirecting the FOV comprises redirecting the FOV toward a headspace within the well.~~

~~69. The method of any one of claims 36 – 39, wherein redirecting the FOV comprises redirecting the FOV toward the dry reagent.~~

~~70. The method of any one of claims 36 – 40, wherein redirecting the FOV comprises redirecting the FOV toward a second aperture and wherein capturing the light comprises capturing the light at the second aperture.~~

~~71. The method of any one of claims 36 – 41, wherein the parameter value comprises a moisture content value.~~

~~72. The method of any one of claims 36 – 42, wherein the parameter value comprises an oxygen content value.~~

~~73. The method of any one of claims 36 – 43, wherein the parameter value comprises a concentration value of at least one component of the dry reagent.~~

~~74. The method of any one of claims 36 – 44, wherein capturing the light comprises capturing one or more of reflective light, emissive light, or the illumination light emitted by the illumination assembly.~~

~~75. The method of any one of claims 36 – 45, wherein capturing the light comprises capturing less than all of the illumination light directed through the aperture.~~