WHAT IS CLAIMED IS:

1. A method for inverted immersion microscopy, the method comprising:

using a microscope objective to image a first sample included in a plurality of samples, wherein the microscope objective is adapted to be immersed in a fluid at a distal portion of the microscope objective, wherein the microscope objective further comprises:

a sensor ring coupled to the distal portion and forming an annulus, and wherein the sensor ring further comprises:

a plurality of sensor electrodes, wherein each sensor electrode of the plurality of sensor electrodes is adapted to remain in contact with the fluid when the fluid immerses the microscope objective;

a common electrode that is adapted to remain in contact with the fluid when the fluid immerses the microscope objective; and

a fluid port to replenish the fluid; and

using an immersion controller coupled to the plurality of sensor electrodes and the common electrode to maintain the fluid over an optical axis diameter of the distal portion of the microscope objective.

2. The method of claim 1 further comprising:

detecting a first resistance between the common electrode and a first sensor electrode;

detecting a second resistance between the common electrode and a second sensor electrode, wherein the second resistance is different than the first resistance, wherein the difference between the first resistance and the second resistance indicates an air gap.

3. The method of claim 2, further comprising:

responsive to detecting the difference between the first resistance and the second resistance, replenishing the fluid via the fluid port.

4. The method of claim 3 further comprising:

detecting the first resistance from the first sensor electrode, wherein the first resistance indicates the fluid is in contact with the first sensor electrode;

ceasing to replenish the fluid in response to detecting the first resistance from the first sensor electrode.

5. The method of claim 1, further comprising:

forming, by a current source, a circuit between the common electrode and each of the plurality of sensor electrodes;

generating, by a signal conditioning unit, a plurality of voltage signals respectively from the plurality of sensor electrodes;

receiving the plurality of voltage signals; and

generating a plurality of digital voltage values corresponding to the plurality of voltage signals.

6. The method of claim 5, further comprising:

receiving, by a multiplexer enabled the plurality of voltage signals; and

generating, by an analog-to-digital converter, the digital voltage values from an output of the multiplexer;

receiving, by a plurality of analog-to-digital converters respectively, the plurality of voltage signals to generate the plurality of digital voltage values.

storing, by a reservoir, a volume of the fluid; and

pumping, by a pump in fluid communication with the reservoir, a fluid from the reservoir to the fluid port.

7. The method of claim 2, wherein the plurality of sensor electrodes are located circumferentially about the annulus, and the plurality of sensor electrodes includes:
(a) at least three sensor electrodes, or
(b) at least five sensor electrodes.

8. The method of claim 1, wherein the sensor ring and the distal portion of the microscope objective form a planar surface.

9. The method of claim 8, wherein (a) the distal portion of the microscope objective and the sensor electrodes are at the same height; or (b) the step of using a microscope objective to image a first sample included in a plurality of samples, further comprises photographing the image.

10. The method of claim 1, further comprising:

detecting a first resistance between the common electrode and a first sensor electrode;

detecting a second resistance between the common electrode and a second sensor electrode, wherein the second resistance is different than the first resistance,

detecting a third resistance between the common electrode and a third sensor electrode, wherein the third resistance is the same as the second resistance, and

wherein the difference between the first resistance and the second resistance indicates an air gap, and

wherein the second resistance and the third resistance being the same indicates the fluid is in contact with the second sensor electrode and the third sensor electrode.

11. The method of claim 10, further comprising:

responsive to detecting the difference between the first resistance and the second resistance, replenishing the fluid via the fluid port.

12. The method of claim 11 further comprising:

detecting the first resistance between the common electrode and the second sensor electrode, wherein the first resistance at the first sensor electrode indicates the fluid is in contact with the first sensor electrode.

13. The method of claim 12 further comprising:

ceasing to replenish the fluid in response to detecting the first resistance from the first sensor electrode.

14. A control system for fluid immersion for inverted microscopy, the control system comprising:

a sensor ring coupled to a distal portion of a microscope objective used with an inverted microscope, wherein the sensor ring forms an annulus enabled to convey a fluid that forms an

immersion layer at a surface of the microscope objective during imaging using the microscope objective, and wherein the sensor ring further comprises:

a plurality of sensor electrodes, wherein each sensor electrode of the plurality of sensor electrodes is adapted to remain in contact with the fluid when the fluid immerses the microscope objective;

a common electrode that is adapted to remain in contact with the fluid when the fluid immerses the microscope objective; and

a fluid port to receive additional fluid to replenish the immersion layer; and

an immersion controller coupled to the plurality of sensor electrodes and the common electrode, the immersion controller enabled to maintain the fluid over an optical axis diameter of the distal portion of the microscope objective.

15. The control system of claim 14 wherein the immersion controller is enabled to:

measure a first resistance between the common electrode and a first sensor electrode;

measure a second resistance between the common electrode and a second sensor electrode, wherein the second resistance is different than the first resistance, and wherein the difference between the first resistance and the second resistance indicates an air gap; and

responsive to detecting the difference between the first resistance and the second resistance, provide the additional fluid via the fluid port to maintain the fluid over an optical axis diameter of the distal portion of the microscope objective.

16. The control system of claim 14, further comprising:

a sensor interface enabled to couple the immersion controller to the sensor electrodes and the common electrode, wherein the sensor interface further comprises:

a current source enabled to form a circuit between the common electrode and the sensor electrodes; and

a signal conditioning unit enabled to generate a plurality of voltage signals respectively from the plurality of sensor electrodes.

17. The control system of claim 16, wherein the immersion controller further comprises the immersion controller enabled for:

receiving the plurality of voltage signals; and

generating a plurality of digital voltage values corresponding to the plurality of voltage signals.

18. The control system of claim 17, wherein the immersion controller further comprises:

a multiplexer enabled to receive the plurality of voltage signals; and

an analog-to-digital converter to generate the digital voltage values from an output of the multiplexer.

19. The control system of claim 14, wherein the plurality of sensor electrodes are located circumferentially about the annulus, and the plurality of sensor electrodes includes:
(a) at least three sensor electrodes, or
(b) at least five sensor electrodes.

20. The control system of claim 14, wherein (a) the sensor ring and the distal portion of the microscope objective form a planar surface; or (b) the distal portion of the microscope objective and the sensor electrodes are at the same height.