

~~What is claimed is:~~ Claims

1. A system comprising:
an objective lens;
a first light source to feed first illuminating light through the objective lens and into a flowcell to be installed in the system, the first illuminating light to be fed using a first grating on the flowcell, wherein the first grating and a second grating are positioned on the flowcell;
and
a first image sensor to capture imaging light using the objective lens, wherein the first grating is positioned outside a field of view of the first image sensor;
- ~~2. The system of claim 1, wherein the flowcell is installed in the system.~~
- ~~3. The system of claim 2, wherein the first grating and a second grating are positioned on the flowcell.~~
- ~~4. The system of claim 3, wherein the first and second gratings have different coupling angles.~~
- ~~5. The system of claim 4, wherein the first and second gratings have different grating periods.~~
6. The system of any of claims 2 to 5, wherein the flowcell includes a first sample surface parallel to a second sample surface, the first grating to couple a first portion of the first illuminating light to illuminate the first sample surface, and the second grating to couple a second portion of the first illuminating light to illuminate the second sample surface.
- ~~7.2. The system of claim 6, further comprising a first planar waveguide into which the first grating couples the first portion of the first illuminating light, and a second planar waveguide into which the second grating couples the second portion of the first illuminating light.~~
- ~~8.3. The system of claim 6, wherein the first grating is offset, relative to the second grating, in a travel direction of the first portion of the first illuminating light.~~
- ~~9. The system of any of claims 2 to 8, wherein the first and second gratings are positioned on opposite sides of a planar waveguide that illuminates the flowcell, the first grating coupling the first illuminating light into the planar waveguide, and the second grating coupling the first illuminating light out of the planar waveguide.~~
- ~~10. The system of claim 9, further comprising a wall that blocks the first illuminating light coupled out of the planar waveguide by the second grating from entering the objective lens.~~

4. ~~The A system of any preceding claim, wherein the~~ comprising:

an objective lens;

a first light source to feed first illuminating light through the objective lens and into a flowcell to be installed in the system, the first illuminating light to be fed using a first grating on the flowcell, wherein the first illuminating light comprises a first light beam of a first wavelength, the system further comprising;

a second light source to feed second illuminating light through the objective lens, the second illuminating light comprising a second light beam of a second wavelength;

a first image sensor to capture imaging light using the objective lens, wherein the first grating is positioned outside a field of view of the first image sensor; and

11. —

12. ~~The system of claim 11, the second light source to feed the second illuminating light through the objective lens into the flowcell via the first grating, the first grating having a symmetric coupling angle for the first and second wavelengths.~~

13. ~~The system of any of claims 11 or 12, the first light source directing the first light beam at a first side of the objective lens, and the second light source directing the second light beam at a second side of the objective lens opposite the first side.~~

14. The system of any of claims 11 to 13, further comprising a first mirror and a tube lens positioned after the first and second light sources and before the objective lens, wherein respective angles of the first and second light beams in propagation from the first mirror to the tube lens reflect corresponding incident angles of the first and second light beams on the first grating.

15.5. ~~The system of claim 144, further comprising a second mirror positioned after the first light source and before the first mirror, the second mirror to provide a spatial separation of the first and second light beams on the first grating.~~

16. ~~The system of any of claims 2 to 15, wherein the flowcell has multiple swaths bounded by respective gratings including the first grating, and wherein the system uses at least one of the respective gratings both as an entry grating and an exit grating.~~

17. ~~The system of any of claims 2 to 16, wherein a waveguide material of the flowcell includes Ta₂O₅.~~

18. ~~The system of any preceding claim, wherein the first image sensor comprises a time delay and integration sensor, the system further comprising a moveable stage holding the flowcell.~~

19. ~~The system of any preceding claim, further comprising a thermal stage to hold~~

~~the flowcell, the thermal stage providing thermal control.~~

~~6. The A system of any preceding claim, further comprising:
an objective lens;~~

~~a first light source to feed first illuminating light through the objective lens and into a flowcell to be installed in the system, the first illuminating light to be fed using a first grating on the flowcell;~~

~~a first image sensor to capture imaging light using the objective lens, wherein the first grating is positioned outside a field of view of the first image sensor; and~~

~~20. a second image sensor that captures images of at least the first grating and a planar waveguide in the flowcell, wherein the system evaluates the images using an alignment criterion.~~

~~7. The system of claim 6, further comprising an optical component that receives both the imaging light and returning excitation light from the flowcell and that separates the imaging light and the returning excitation light from each other.~~

~~8. The system of claim 7, wherein the second image sensor is positioned upstream of the optical component.~~

~~9. The system of claim 7, further comprising a beamsplitter that redirects at least some of the returning excitation light toward the second image sensor.~~

~~10. The system of claim 9, wherein the beamsplitter has an asymmetrically reflective coating.~~

~~11. The system of claim 7, wherein the second image sensor has a field of view, and wherein the field of view of the second image sensor has a size so that at least the first grating is visible in the field of view of the second image sensor.~~

~~12. The system of claim 11, wherein evaluating the images using the alignment criterion includes taking into account how much light is visible in at least a first area where the first illuminating light is reflected by the first grating.~~

~~13. The system of claim 12, wherein the first grating and a second grating are positioned on the flowcell, wherein the first and second gratings are positioned on opposite sides of a planar waveguide that illuminates the flowcell, and wherein evaluating the images using the alignment criterion further includes taking into account how much light is visible in a second area associated with the second grating.~~

~~21. The system of any preceding claim, the light having a wavelength to trigger a fluorescent response from a sample in the flowcell.~~

~~22. A flowcell comprising:~~

a substrate to hold a sample;
a first planar waveguide to lead first light for the sample;
a first grating to couple the first light;
a second planar waveguide to lead second light for the sample; and
a second grating to couple the second light.

23. — The flowcell of claim 22, wherein the first grating is positioned on the first planar waveguide, and wherein the second grating is positioned on the second planar waveguide.

24. — The flowcell of any of claims 22 or 23, wherein the first and second gratings have different coupling angles.

25. — The flowcell of claim 24, wherein the first and second gratings have different grating periods.

26. — The flowcell of any of claims 22 to 25, wherein the flowcell includes a first sample surface parallel to a second sample surface, the first grating to couple the first light to illuminate the first sample surface, and the second grating to couple the second light to illuminate the second sample surface.

27. — The flowcell of claim 26, wherein the first grating is offset, relative to the second grating, in a travel direction of the first light.

28. — The flowcell of any of claims 22 to 27, the first grating to couple the first light into the first waveguide, the second grating to couple the second light into the second waveguide, the flowcell further comprising a third grating to couple the first light out of the first planar waveguide, and a fourth grating to couple the second light out of the second planar waveguide.

29. — A method comprising:
feeding illuminating light through an objective lens and into a flowcell using a first grating positioned outside an image sensor field of view; and
capturing imaging light using the objective lens.

30. — The method of claim 29, wherein the flowcell includes a first sample surface parallel to a second sample surface, the method further comprising directing a first component of the illuminating light to a first grating aligned with the first sample surface, and directing a second component of the illuminating light to a second grating aligned with the second sample surface.

31. — The method of claim 30, further comprising adjusting the objective lens to focus on the first sample surface in connection with directing the first component of the

illuminating light to the first grating, and adjusting the objective lens to focus on the second sample surface in connection with directing the second component of the illuminating light to the second grating.

32. — The method of any of claims 29 to 31, wherein the illuminating light comprises a first light beam of a first wavelength, and a second light beam of a second wavelength, the method further comprising directing the first light beam at a first side of the objective lens, and directing the second light beam at a second side of the objective lens opposite the first side.

33. — The method of claim 32, further comprising blocking the illuminating light, upon the illuminating light exiting the flowcell, from entering the objective lens.

34. — The method of any of claims 29 to 33, wherein a thermal stage holds the flowcell, the method further comprising providing thermal control of the flowcell using the flowcell.

35. — The method of any of claims 29 to 34, wherein the flowcell has multiple swaths bounded by respective gratings including the first grating, the method further comprising using at least one of the respective gratings both as an entry grating and an exit grating.

36. — The method of any of claims 29 to 35, further comprising performing an alignment process that evaluates a quality of coupling by the first grating.