

CLAIMS

What is claimed:

1. A system for analyzing a sample, comprising:
 - one or more support members configured to support a sample;
 - an illumination source;
 - a first switch optically coupled to the illumination source;
 - a plurality of transmitting optical fibers coupled to the first switch, wherein the first switch is configured to optically couple the illumination source to at least one transmitting optical fiber of the plurality of transmitting optical fibers;
 - a detector;
 - a second switch optically coupled to the detector;
 - a plurality of receiving optical fibers coupled to the second switch, wherein the second switch is configured to optically couple the detector to at least one receiving optical fiber of the plurality of receiving optical fibers; and
 - a plurality of probes coupled to respective ones of the plurality of transmitting optical fibers and respective ones of the plurality of receiving optical fibers, the plurality of probes configured to illuminate respective portions of a surface of the sample and configured to receive illumination reflected, refracted, or radiated from the respective portions of the surface of the sample.
2. The system of claim 1, wherein the at least one transmitting optical fiber and the at least one receiving optical fiber are coupled to at least one probe of the plurality of probes by at least one of a bifurcated fiber bundle, a fan-out cable, or a Y-cable.
3. The system of claim 1, wherein at least one probe of the plurality of probes includes a portion of the at least one transmitting optical fiber and a portion of the at least one receiving optical fiber.

4. The system of claim 3, wherein the at least one probe further includes a housing that at least partially surrounds the portion of the at least one transmitting optical fiber and the portion of the at least one receiving optical fiber.

5. The system of claim 1, further comprising:
one or more optical elements in series with at least one of the at least one transmitting optical fiber or the at least one receiving optical fiber.

6. The system of claim 5, wherein the one or more optical elements include at least one focusing lens.

7. The system of claim 5, wherein the one or more optical elements include at least one collimating lens.

8. The system of claim 5, wherein the one or more optical elements are in series with at least one probe that is coupled to the at least one transmitting optical fiber and the at least one receiving optical fiber.

9. The system of claim 8, wherein the at least one probe includes or is coupled to the one or more optical elements.

10. The system of claim 1, further comprising:
an optics plate configured to support the plurality of probes, wherein the plurality of probes are at least partially disposed within a plurality of openings defined by the optics plate.

11. The system of claim 1, further comprising:
at least one controller communicatively coupled to the first switch and the second switch, the at least one controller configured to analyze at least one portion of the sample by:

causing the first switch to optically couple the illumination source to at least one transmitting optical fiber of the plurality of transmitting optical fibers; and
causing the second switch to optically couple the detector to at least one receiving optical fiber of the plurality of receiving optical fibers.

12. The system of claim 11, wherein the at least one controller is configured to analyze at least one other portion of the sample by:

causing the first switch to optically couple the illumination source to at least one other transmitting optical fiber of the plurality of transmitting optical fibers; and
causing the second switch to optically couple the detector to at least one other receiving optical fiber of the plurality of receiving optical fibers, wherein the at least one other transmitting optical fiber and the at least one other receiving optical fiber are coupled to another probe of the plurality of probes.

13. The system of claim 11, wherein the controller is configured to simultaneously analyze two or more portions of the sample by:

causing the first switch to optically couple the illumination source to two or more transmitting optical fibers of the plurality of transmitting optical fibers; and
causing the second switch to optically couple the detector to two or more receiving optical fibers of the plurality of receiving optical fibers, wherein the two or more transmitting optical fibers and the two or more receiving optical fibers are coupled to two or more respective probes of the plurality of probes.

14. The system of claim 1, wherein the one or more support members are configured to actuate the sample in one or more directions.

15. The system of claim 1, wherein the one or more support members are configured to rotate the sample clockwise or counterclockwise.

16. The system of claim 1, wherein the illumination source comprises at least one broadband illumination source.

17. The system of claim 16, wherein the at least one broadband illumination source comprises at least one of a discharge plasma light source, a laser driven plasma light source, or a supercontinuum light source.

18. The system of claim 1, wherein the detector comprises a spectrometer.

19. The system of claim 1, wherein the sample comprises at least one of a wafer, a reticle, or a panel.

20. The system of claim 1, further comprising:
a second illumination source;
a third switch optically coupled to the second illumination source;
a second plurality of transmitting optical fibers coupled to the third switch, wherein the third switch is configured to optically couple the second illumination source to a transmitting optical fiber of the second plurality of transmitting optical fibers;
a second detector;
a fourth switch optically coupled to the second detector;
a second plurality of receiving optical fibers coupled to the fourth switch, wherein the fourth switch is configured to optically couple the second detector to a receiving optical fiber of the second plurality of receiving optical fibers; and
a second plurality of probes coupled to respective ones of the second plurality of transmitting optical fibers and respective ones of the second plurality of receiving optical fibers, the second plurality of probes configured to illuminate respective portions of a backside surface of the sample and configured to receive illumination reflected, refracted, or radiated from the respective portions of the backside surface of the sample.

21. The system of claim 20, wherein the one or more support members are configured to support the sample by contacting two or more edges of the sample, wherein at least a portion of the backside surface of the sample is left exposed.

22. The system of claim 20, wherein the one or more support members are configured to support the sample by contacting a first portion of the backside surface of the sample, wherein a second portion of the backside surface of the sample is left exposed.

23. The system of claim 1, wherein the one or more support members comprise a substrate with a plurality of suction ports for holding the sample against the substrate with a suction force, wherein the substrate is configured to support the plurality of probes, wherein the plurality of probes are at least partially disposed within a plurality of openings defined by the substrate.

24. The system of claim 1, wherein the system is configured to be integrated within a wafer handler for at least one of a process tool or multi-function analysis tool.

25. A system for analyzing a sample, comprising:
one or more support members configured to support a sample;
an illumination source;
a plurality of transmitting optical fibers optically coupled to the illumination source;
a detector;
a plurality of receiving optical fibers optically coupled to the detector; and
a plurality of probes coupled to respective ones of the plurality of transmitting optical fibers and respective ones of the plurality of receiving optical fibers, the plurality of probes configured to illuminate respective portions of a surface of the sample and configured to receive illumination reflected, refracted, or radiated from the respective portions of the surface of the sample.

26. The system of claim 25, further comprising:
a first splitter configured to optically couple the illumination source to the plurality of transmitting optical fibers; and
a second splitter configured to optically couple the detector to the plurality of receiving optical fibers.

27. The system of claim 25, wherein a transmitting optical fiber and a receiving optical fibers are coupled to a respective probe of the plurality of probes by at least one of a bifurcated fiber bundle, a fan-out cable, or a Y-cable.

28. The system of claim 25, wherein at least one probe includes a portion of a transmitting optical fiber and a portion of a receiving optical fiber.

29. The system of claim 28, wherein the at least one probe further includes a housing that at least partially surrounds the portion of the transmitting optical fiber and the portion of the receiving optical fiber.

30. The system of claim 25, further comprising:
one or more optical elements in series with at least one of a transmitting optical fiber or a receiving optical fiber.

31. The system of claim 30, wherein the one or more optical elements include at least one focusing lens.

32. The system of claim 30, wherein the one or more optical elements include at least one collimating lens.

33. The system of claim 30, wherein at least one probe includes or is coupled to the one or more optical elements.

34. The system of claim 25, further comprising:

an optics plate configured to support the plurality of probes, wherein the plurality of probes are at least partially disposed within a plurality of openings defined by the optics plate.

35. The system of claim 25, wherein the one or more support members are configured to actuate the sample in one or more directions.

36. The system of claim 25, wherein the one or more support members are configured to rotate the sample clockwise or counterclockwise.

37. The system of claim 25, wherein the illumination source comprises at least one broadband illumination source.

38. The system of claim 37, wherein the at least one broadband illumination source comprises at least one of a discharge plasma light source, a laser driven plasma light source, or a supercontinuum light source.

39. The system of claim 25, wherein the detector comprises a spectrometer.

40. The system of claim 39, wherein the spectrometer comprises an imaging spectrometer.

41. The system of claim 25, wherein the sample comprises at least one of a wafer, a reticle, or a panel.

42. The system of claim 25, further comprising:
a second illumination source;
a second plurality of transmitting optical fibers optically coupled to the second illumination source;
a second detector;

a second plurality of receiving optical fibers optically coupled to the second detector; and

a second plurality of probes coupled to respective ones of the second plurality of transmitting optical fibers and respective ones of the second plurality of receiving optical fibers, the second plurality of probes configured to illuminate respective portions of a backside surface of the sample and configured to receive illumination reflected, refracted, or radiated from the respective portions of the backside surface of the sample.

43. The system of claim 42, wherein the one or more support members are configured to support the sample by contacting two or more edges of the sample, wherein at least a portion of the backside surface of the sample is left exposed.

44. The system of claim 42, wherein the one or more support members are configured to support the sample by contacting a first portion of the backside surface of the sample, wherein a second portion of the backside surface of the sample is left exposed.

45. The system of claim 25, wherein the one or more support members comprise a substrate with a plurality of suction ports for holding the sample against the substrate with a suction force, wherein the substrate is configured to support the plurality of probes, wherein the plurality of probes are at least partially disposed within a plurality of openings defined by the substrate.

46. The system of claim 25, wherein the system is configured to be integrated within a wafer handler for at least one of a process tool or multi-function analysis tool.

47. A method of analyzing a sample, comprising:

supporting a sample with one or more support members proximate to a plurality of probes, the plurality of probes coupled to respective ones of a plurality of transmitting optical fibers and respective ones of a plurality of receiving optical fibers;

optically coupling an illumination source to at least one transmitting optical fiber of the plurality of transmitting optical fibers with a first switch to illuminate at least one portion of a surface of the sample with at least one probe that is coupled to the at least one transmitting optical fiber, the at least one probe being further coupled to at least one receiving optical fiber of the plurality of receiving optical fibers; and

optically coupling a detector to the at least one receiving optical fiber with a second switch to receive illumination reflected, refracted, or radiated from the at least one portion of the surface of the sample via the at least one probe.

48. The method of claim 47, further comprising:

optically coupling the illumination source to at least one other transmitting optical fiber of the plurality of transmitting optical fibers with the first switch to illuminate at least one other portion of the surface of the sample with at least one other probe that is coupled to the at least one other transmitting optical fiber, the at least one other probe being further coupled to at least one other receiving optical fiber of the plurality of receiving optical fibers; and

optically coupling the detector to the at least one other receiving optical fiber with the second switch to receive illumination reflected, refracted, or radiated from the at least one other portion of the surface of the sample via the at least one other probe.

49. The method of claim 47, further comprising:

actuating the sample in one or more directions.

50. The method of claim 47, further comprising:

rotating the sample clockwise or counterclockwise.

51. The method of claim 47, further comprising:

supporting the sample with the one or more support members proximate to a second plurality of probes, the second plurality of probes coupled to respective ones of a second plurality of transmitting optical fibers and respective ones of a second plurality of receiving optical fibers;

optically coupling a second illumination source to at least one transmitting optical fiber of the second plurality of transmitting optical fibers with a third switch to illuminate at least one portion of a backside surface of the sample with at least one probe of the second plurality of probes that is coupled to the at least one transmitting optical fiber of the second plurality of transmitting optical fibers, the at least one probe being further coupled to at least one receiving optical fiber of the second plurality of receiving optical fibers; and

optically coupling a second detector to the at least one receiving optical fiber of the second plurality of receiving optical fibers with a fourth switch to receive illumination reflected, refracted, or radiated from the at least one portion of the backside surface of the sample via the at least one probe of the second plurality of probes.

52. The method of claim 51, wherein the one or more support members contact two or more edges of the sample, and at least a portion of the backside surface of the sample is left exposed.

53. The method of claim 51, wherein the one or more support members contact a first portion of the backside surface of the sample, and a second portion of the backside surface of the sample is left exposed.