Claims

1. A metrology system comprising:

an illumination source configured to generate an amount of illumination light;

an illumination optics subsystem configured to direct the amount of illumination light from the illumination source to a measurement spot on a surface of a specimen under measurement at one or more angles of incidence within a plane of incidence;

a detector having a planar, two-dimensional surface sensitive to incident light, wherein the detector is configured to generate a plurality of output signals indicative of a response of the specimen to the amount of illumination light by integrating charge over a plurality of pixels in a direction perpendicular to a direction of wavelength dispersion on the detector surface; and

a collection optics subsystem configured to collect an amount of collected light from the measurement spot on the surface of the specimen and direct the amount of collected light to the surface of the detector, wherein the collection optics subsystem images the measurement spot onto the surface of the detector such that a direction aligned with the plane of incidence on the wafer surface is oriented perpendicular to the direction of wavelength dispersion on the detector surface.

2. The metrology system of claim 1, wherein the amount of illumination light is broadband illumination light including a range of wavelengths spanning at least 500 nanometers.

3. The metrology system of claim 1, wherein at least a portion of the amount of illumination light is provided to the specimen at a normal angle of incidence.

4. The metrology system of claim 1, wherein at least a portion of the amount of illumination light is provided to the specimen at an oblique angle of incidence.

5. The metrology system of claim 1, wherein the metrology system is configured as any one or more of a spectroscopic ellipsometer and a spectroscopic reflectometer.

6. The metrology system of claim 1, wherein a projection of a polarizer slit of the illumination optics subsystem underfills a spectrometer slit of the metrology system.

7. The metrology system of claim 1, wherein the illumination source is a laser driven light source.

8. The metrology system of claim 1, wherein the illumination optics subsystem includes a programmable illumination field stop configured to limit an illumination field projected onto the specimen in a direction orthogonal to the plane of incidence.

9. The metrology system of claim 1, further comprising:

a controller configured to:

transmit a command signal to the programmable illumination field stop to alter a state of the illumination field stop to achieve a desired point spread function along the direction of wavelength dispersion on the detector surface.

10. The metrology system of claim 1, wherein a beam size of the amount of illumination light projected onto a surface of the specimen is smaller than a size of a measurement target that is measured on the surface of the specimen.

11. The metrology system of claim 1, wherein the detector is a charge coupled device (CCD) detector.

12. An apparatus comprising:

an illumination system configured to direct an amount of broadband illumination light from an illumination source to a measurement spot on a surface of a specimen under measurement at one or more angles of incidence within a plane of incidence;

a spectroscopic detector having a planar, two-dimensional surface sensitive to incident light, wherein the spectroscopic detector is configured to generate a plurality of

output signals by integrating charge over a plurality of pixels in a direction perpendicular to a direction of wavelength dispersion on the detector surface; and

a collection optics subsystem configured to collect an amount of collected light from the measurement spot on the surface of the specimen and direct the amount of collected light to the surface of the spectroscopic detector, wherein the collection optics subsystem images the measurement spot onto the surface of the spectroscopic detector such that a direction aligned with the plane of incidence on the wafer surface is oriented perpendicular to the direction of wavelength dispersion on the spectroscopic detector surface.

13. The apparatus of claim **12**, wherein the illumination system includes a programmable illumination field stop configured to limit an illumination field projected onto the specimen in a direction orthogonal to the plane of incidence.

14. The apparatus of claim **13**, further comprising:

a controller configured to:

transmit a command signal to the programmable illumination field stop to alter a state of the illumination field stop to achieve a desired point spread function along the direction of wavelength dispersion on the detector surface.

15. A method comprising:

projecting an amount of broadband illumination light from an illumination source to a measurement spot on a surface of a specimen under measurement at one or more angles of incidence within a plane of incidence;

imaging an amount of collected light from the measurement spot on the surface of the specimen to a surface of a two-dimensional detector surface such that a direction aligned with the plane of incidence on the specimen surface is oriented perpendicular to a direction of wavelength dispersion on the detector surface; and

generating a plurality of output signals indicative of a response of the specimen to the amount of illumination light, wherein the generating of the plurality of output signals involves integrating charge over a plurality of pixels in a direction perpendicular to the direction of wavelength dispersion on the detector surface.

16. The method of claim **15**, further comprising:

determining an estimate of a structural parameter based at least in part on the plurality of output signals.

17. The method of claim **15**, wherein the amount of broadband illumination light includes a range of wavelengths spanning at least 500 nanometers.

18. The method of claim **15**, wherein at least one of the one or more angles of incidence is an oblique angle of incidence.

19. The method of claim **15**, further comprising:

limiting an extent of an illumination field projected onto the surface of the specimen in a direction orthogonal to the plane of incidence.

20. The method of claim **19**, wherein the limiting of the extent of the illumination field involves transmitting a command signal to a programmable illumination field stop to alter a state of the illumination field stop to achieve a desired point spread function along the direction of wavelength dispersion on the detector surface.