

CLAIMS

1. A method for inspecting semiconductor samples, comprising:
 - (a) on an inspection tool, selecting one of a plurality of different wavelength ranges for each of a plurality of different layers of interest of one or more semiconductor samples , wherein selecting one of the plurality different wavelength ranges for each of the plurality of different layers of interest comprises:
 - (i) selecting a shorter wavelength range that is below an absorption edge wavelength of SiO₂ for a first one of the different layers of interest that does not have SiO₂ present within or near such first layer of interest or has SiO₂ present below such first layer of interest;
 - (ii) selecting a longer wavelength range that is above the absorption edge wavelength for a second one of the different layers of interest that has SiO₂ present above such second layer of interest; and
 - (iii) selecting a narrow and shorter wavelength range at a third one of the different layers of interest that has SiO₂ present within such third layer of interest;
 - (b) on the inspection tool, directing at least one incident beam at the different wavelength ranges towards the different layers of interest and, in response, obtaining a plurality of output signals or images for each of the different layers of interest; and
 - (c) analyzing the output signals or images from each of the different layers of interest to detect defects in such different layers of interest.
2. The method of claim 1, wherein selecting the different wavelength ranges includes determining whether there is SiO₂ present within or near each of the different layers of interest as specified in a design database with which the sample was fabricated.
3. The method of claim 1, wherein selecting the different wavelength ranges includes determining whether there is SiO₂ present within or near each of the different layers of interest as specified with a list of layers and material type without provision of a design database with which the sample was fabricated.

4. The method of claim 1, further comprising applying a horizontal or vertical polarization to the at least one incident beam.
5. The method of claim 1, further comprising selecting different aperture settings for the at least one incident beam to achieve a particular angle of incidence for at least some of the different layers of interest.
6. The method of claim 1, wherein at least some of the different wavelength ranges for a particular layer of interest having a vertical stack structure include a longer wavelength range to detect defects on both a surface and throughout a depth of the vertical stack structure and a shorter wavelength range to detect defects on the surface of the vertical stack structure.
7. An inspection system for inspecting a semiconductor sample, comprising:
 - (a) an illumination optics module for generating and directing an incident beam towards one or more semiconductor sample at one of a plurality of different wavelength ranges for each of a plurality of different layers of interest;
 - (b) a collection optics module for collecting an output beam that is reflected or scattered from the different layers of interest in response to the incident beam; and
 - (c) a controller that is configured to perform the following operations:
 - (i) for each of the plurality of different layers of interest selecting:
 - (1) a shorter wavelength range that is below an absorption edge wavelength of SiO_2 for a first one of the different layers of interest that does not have SiO_2 present within or near such first layer of interest or has SiO_2 present below such first layer of interest;
 - (2) a longer wavelength range that is above the absorption edge wavelength for a second one of the different layers of interest that has SiO_2 present above such second layer of interest; and
 - (3) a narrow and shorter wavelength range at a third one of the different layers of interest that has SiO_2 present within such third layer of interest;

- (ii) causing at least one incident beam to be directed at the different wavelength ranges towards the different layers of interest and, in response, obtaining a plurality of output signals or images for each of the different layers of interest; and
- (iii) analyzing the output signals or images from each of the different layers of interest to detect defects in such different layers of interest.

8. The system of claim 7, wherein selecting the different wavelength ranges includes determining whether there is SiO₂ present within or near each of the different layers of interest as specified in a design database with which the sample was fabricated.

9. The system of claim 7, wherein selecting the different wavelength ranges includes determining whether there is SiO₂ present within or near each of the different layers of interest as specified with a list of layers and material type without provision of a design database with which the sample was fabricated.

10. The system of claim 7, wherein the controller is further configured for applying a horizontal or vertical polarization to the at least one incident beam.

11. The system of claim 7, wherein the controller is further configured for selecting different aperture settings for the at least one incident beam to achieve a particular angle of incidence for at least some of the different layers of interest.

12. The system of claim 7, wherein at least some of the different wavelength ranges for a particular layer of interest having a vertical stack structure include a longer wavelength range to detect defects on both a surface and throughout a depth of the vertical stack structure and a shorter wavelength range to detect defects on the surface of the vertical stack structure.