

CLAIMS

1. Imaging method for controlling for the presence, at a surface of an object (20) such as a wafer, of structures (70a, 70b, 70c) enclosed in said object (20) such as vias, utilizing an imaging sensor (22), optical imaging means (34) capable of producing on said imaging sensor (22) an image (73, 74) of the object (20) and of said structures (70a, 70b, 70c) in a field of view, and illuminating means (23) for generating illuminating beams (25) and illuminating said field of view in reflection, said illuminating beams (25) being incident in the field of view along an axis of illumination substantially parallel to the optical axis (49) of the optical imaging means (34), characterized in that it comprises steps of:

- acquiring a first image (73) of the object (20) by illuminating said object (20) with a first illuminating beam (25) the spectral content of which is suited to the nature of the object (20) so that the light of said first illuminating beam (25) is capable of penetrating into said object (20),
- acquiring a second image (74) of the object (20) by illuminating said object (20) with a second illuminating beam (25) the spectral content of which is suited to the nature of the object (20) so that the light of said second illuminating beam (25, 30) is reflected by the surface of the object (20), and
- comparing said first and second images (73, 74) so as to identify structures (71a) that appear in the first image (73) but not in the second image (74).

2. Imaging device for controlling for the presence, at a surface of an object (20) such as a wafer, of structures (70a, 70b, 70c) such as vias enclosed in said object (20), comprising:

- an imaging sensor (22),
- optical imaging means (34) capable of producing on said imaging sensor (22) an image of the object (20) and of said structures (70a, 70b, 70c) in a field of view,
- illuminating means (23) for generating illuminating beams (25) and lighting said field of view in reflection, said illuminating beams (25) being incident in the field of view along an axis of illumination substantially parallel to the optical axis (49) of the optical imaging means (34),
characterized in that the illuminating means (23) are capable of:
 - generating a first illuminating beam (25) the spectral content of which is suited to the nature of the object (20), so that the light of said first illuminating beam (25) is capable of penetrating into said object (20), and
 - generating a second illuminating beam (25, 30) the spectral content of which is suited to the nature of the object (20), so that the light of said second illuminating beam (25) is reflected by the surface of the object (20).

3. The device of claim 2, in which the illuminating means (23) comprise a spectral filter (26) capable of limiting the spectrum of the illuminating beam to wavelengths which are capable essentially of penetrating into the object (20).

4. The device of claim 3, in which the spectral filter (26) comprises a plate made of a material identical or similar to a material of the object (20).

5. The device of one of claims 3 or 4, in which the spectral filter (26) comprises a silicon plate.

6. The device of one of claims 3 to 5, in which the illuminating means (23) also comprise:

- a light source (24) capable of emitting light with a spectrum comprising first wavelengths capable essentially of being reflected by the surface of the object (20) and second wavelengths capable essentially of penetrating into the object (20), and
- switching means for inserting the spectral filter (26) into, or withdrawing it from, the illuminating beam.

7. The device of claim 2, in which the illuminating means (23) comprise a light source capable of emitting a light the spectrum of which is limited to wavelengths capable essentially of penetrating into the object (20).

8. The device of claim 7, in which the illuminating means (23) also comprise a second light source capable of emitting a light the spectrum of which is limited to wavelengths capable essentially of being reflected by the surface of the object (20).

9. The device of any one of the claims 2 to 8, which further comprises an illuminating beam (30) incident in the field of view along an axis of illumination forming, with the optical axis (49) of the imaging system, an angle greater than the angle (35) defining the numerical aperture of said imaging system.

10. The device of any one of the claims 2 to 9, which also comprises a light source in transmission (32) arranged so as to illuminate the field of view in transmission, through the object (20).

11. The device of any one of the claims 2 to 10, in which the imaging sensor (22) comprises a CCD- or CMOS-type sensor on a silicon substrate.

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5 object (20) such as a wafer, of structures (70a, 70b, 70c) enclosed in said
object (20) such as vias, utilizing an imaging sensor (22), optical imaging
means (34) capable of producing on said imaging sensor (22) an image (73,
74) of the object (20) and of said structures (70a, 70b, 70c) in a field of view,
and illuminating means (23) for generating illuminating beams (25) and
10 illuminating said field of view in reflection, said illuminating beams (25) being
incident in the field of view along an axis of illumination substantially parallel
to the optical axis (49) of the optical imaging means (34), characterized in
that it comprises steps of:

- acquiring a first image (73) of the object (20) by illuminating said
15 object (20) with a first illuminating beam (25) the spectral content of which is
suited to the nature of the object (20) so that the light of said first
illuminating beam (25) is capable of penetrating into said object (20),

- acquiring a second image (74) of the object (20) by illuminating said
object (20) with a second illuminating beam (25) the spectral content of
20 which is suited to the nature of the object (20) so that the light of said second
illuminating beam (25, 30) is reflected by the surface of the object (20), and

- comparing said first and second images (73, 74) so as to identify
structures (71a) that appear in the first image (73) but not in the second
image (74).

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2. Imaging device for controlling for the presence, at a surface of an
object (20) such as a wafer, of structures (70a, 70b, 70c) such as vias
enclosed in said object (20), comprising:

- an imaging sensor (22),
- 30 - optical imaging means (34) capable of producing on said imaging
sensor (22) an image of the object (20) and of said structures (70a, 70b, 70c)
in a field of view,

- illuminating means (23) for generating illuminating beams (25) and
lighting said field of view in reflection, said illuminating beams (25) being

incident in the field of view along an axis of illumination substantially parallel to the optical axis (49) of the optical imaging means (34),

characterized in that the illuminating means (23) are capable of:

- generating a first illuminating beam (25) the spectral content of which is suited to the nature of the object (20), so that the light of said first illuminating beam (25) is capable of penetrating into said object (20), and
- generating a second illuminating beam (25, 30) the spectral content of which is suited to the nature of the object (20), so that the light of said second illuminating beam (25) is reflected by the surface of the object (20).

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3. The device of claim 2, in which the illuminating means (23) comprise a spectral filter (26) capable of limiting the spectrum of the illuminating beam to wavelengths which are capable of penetrating into the object (20).

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4. The device of claim 3, in which the spectral filter (26) comprises a plate made of a material identical or similar to a material of the object (20).

5. The device of one of claims 3 or 4, in which the spectral filter (26) comprises a silicon plate.

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6. The device of one of claims 3 to 5, in which the illuminating means (23) also comprise:

- a light source (24) capable of emitting light with a spectrum comprising first wavelengths capable of being reflected by the surface of the object (20) and second wavelengths capable of penetrating into the object (20), and
- switching means for inserting the spectral filter (26) into, or withdrawing it from, the illuminating beam.

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7. The device of claim 2, in which the illuminating means (23) comprise a light source capable of emitting a light the spectrum of which is limited to wavelengths capable of penetrating into the object (20).

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8. The device of claim 7, in which the illuminating means (23) also comprise a second light source capable of emitting a light the spectrum of

which is limited to wavelengths capable of being reflected by the surface of the object (20).

5 **9.** The device of any one of the claims 2 to 8, which further comprises an illuminating beam (30) incident in the field of view along an axis of illumination forming, with the optical axis (49) of the imaging system, an angle greater than the angle (35) defining the numerical aperture of said imaging system.

10 **10.** The device of any one of the claims 2 to 9, which also comprises a light source in transmission (32) arranged so as to illuminate the field of view in transmission, through the object (20).

15 **11.** The device of any one of the claims 2 to 10, in which the imaging sensor (22) comprises a CCD- or CMOS-type sensor on a silicon substrate.