CLAIMS

1. A zone plate comprising:

a mask layer that is at least substantially non-transmissive to an electromagnetic radiation impinging on the zone plate; and

a plurality of apertures defined through the mask layer, the plurality of apertures being at least substantially transmissive to the electromagnetic radiation, wherein the plurality of apertures are distributed in at least one concentric pattern so as to diffract the electromagnetic radiation and focus the diffracted electromagnetic radiation into a subwavelength focal spot on a desired focal plane.

2. The zone plate as claimed in claim 1, wherein the plurality of apertures are distributed in a plurality of concentric patterns.

3. The zone plate as claimed in claim 2, wherein the plurality of apertures distributed in the plurality of concentric patterns have diameters that change in a radial direction.

4. The zone plate as claimed in claim 2 or 3, wherein adjacent concentric patterns of the plurality of concentric patterns are arranged relative to each other at a distance in a range of between 0 and about 1 μm.

5. The zone plate as claimed in any one of claims 1 to 4, wherein a number of the plurality of apertures distributed in each concentric pattern is equal to 10 or more.

6. The zone plate as claimed in any one of claims 1 to 5, wherein the plurality of apertures have a diameter in a range of between about 0.1 nm and about 1 μm.

7. The zone plate as claimed in any one of claims 1 to 6, wherein the plurality of apertures have a thickness in a range of between about 10 nm and about 10 μm.

8. The zone plate as claimed in any one of claims 1 to 7, wherein the plurality of apertures are distributed periodically spaced apart from each other in each concentric pattern.

9. The zone plate as claimed in any one of claims 1 to 8, wherein the plurality of apertures are spaced apart from each other in each concentric pattern at a spacing in a range of between about 0.1 nm and about 1 μm.

10. The zone plate as claimed in any one of claims 1 to 9, wherein a respective aperture of the plurality of apertures has a shape selected from the group consisting of a circle, a ring, a triangle, a square, a rectangle and an ellipse.

11. The zone plate as claimed in any one of claims 1 to 10, wherein the plurality of apertures comprise holey structures.

12. The zone plate as claimed in any one of claims 1 to 11, further comprising at least one concentric aperture defined through the mask layer and arranged concentrically with the at least one concentric pattern, the at least one concentric aperture being at least substantially transmissive to the electromagnetic radiation.

13. The zone plate as claimed in claim 12, wherein each concentric aperture has a width in a range of between about 1 nm and about 1 μm.

14. The zone plate as claimed in claim 12 or 13, further comprising a plurality of concentric apertures defined through the mask layer and arranged concentrically with the at least one concentric pattern.

15. The zone plate as claimed in claim 14, wherein adjacent concentric apertures of the plurality of concentric apertures are arranged spaced apart from each other at a spacing in a range of between about 0.1 nm and about 1 μm.

16. The zone plate as claimed in claim 14 or 15, wherein the plurality of apertures are distributed in a plurality of concentric patterns, and wherein the plurality of concentric apertures are arranged alternately with the plurality of concentric patterns.

17. The zone plate as claimed in any one of claims 1 to 16, wherein the mask layer comprises at least one of a metal, a semiconductor or a polymer.

18. The zone plate as claimed in any one of claims 1 to 17, further comprising:

a substrate, wherein the mask layer is arranged over the substrate, and

wherein the substrate is at least substantially transmissive to the electromagnetic radiation.

19 A microscope comprising a zone plate as claimed in any one of claims 1 to 18.

20. An imaging device comprising:

a source configured to provide an electromagnetic radiation; and

a zone plate as claimed in any one of claims 1 to 18, the zone plate arranged to diffract the electromagnetic radiation and focus the diffracted electromagnetic radiation for imaging an object.

CLAIMS

1. A zone plate comprising:

a mask layer that is at least substantially non-transmissive to an electromagnetic radiation impinging on the zone plate; and

a plurality of apertures defined through the mask layer, the plurality of apertures being at least substantially transmissive to the electromagnetic radiation, wherein ~~theplurality~~the plurality of apertures are distributed in at least one concentric pattern so as to diffract the electromagnetic radiation and focus the diffracted electromagnetic radiation into a subwavelength focal spot on ~~to~~ a desired focal plane.

2. The zone plate as claimed in claim 1, wherein the plurality of apertures are distributed in a plurality of concentric patterns.

3. The zone plate as claimed in claim 2, wherein the plurality of apertures distributed in the plurality of concentric patterns have diameters that change in a radial direction.

4. The zone plate as claimed in claim 2 or 3, wherein adjacent concentric patterns of the plurality of concentric patterns are arranged relative to each other at a distance in a range of between 0 and about 1 μm.

5. The zone plate as claimed in any one of claims 1 to 4, wherein a number of the plurality of apertures distributed in each concentric pattern is equal to 10 or more.

6. The zone plate as claimed in any one of claims 1 to 5, wherein the plurality of apertures have a diameter in a range of between about 0.1 nm and about 1 μm.

7. The zone plate as claimed in any one of claims 1 to 6, wherein the plurality of apertures have a thickness in a range of between about 10 nm and about 10 μm.

8. The zone plate as claimed in any one of claims 1 to 7, wherein the plurality of apertures are distributed periodically spaced apart from each other in each concentric pattern.

9. The zone plate as claimed in any one of claims 1 to 8, wherein the plurality of apertures are spaced apart from each other in each concentric pattern at a spacing in a range of between about 0.1 nm and about 1 μm.

10. The zone plate as claimed in any one of claims 1 to 9, wherein a respective aperture of the plurality of apertures has a shape selected from the group consisting of a circle, a ring, a triangle, a square, a rectangle and an ellipse.

11. The zone plate as claimed in any one of claims 1 to 10, wherein the plurality of apertures comprise holey structures.

12. The zone plate as claimed in any one of claims 1 to 11, further comprising at least one concentric aperture defined through the mask layer and arranged concentrically with the at least one concentric pattern, the at least one concentric aperture being at least substantially transmissive to the electromagnetic radiation.

13. The zone plate as claimed in claim 12, wherein each concentric aperture has a width in a range of between about 1 nm and about 1 μm.

14. The zone plate as claimed in claim 12 or 13, further comprising a plurality of concentric apertures defined through the mask layer and arranged concentrically with the at least one concentric pattern.

15. The zone plate as claimed in claim 14, wherein adjacent concentric apertures of the plurality of concentric apertures are arranged spaced apart from each other at a spacing in a range of between about 0.1 nm and about 1 μm.

16. The zone plate as claimed in claim 14 or 15, wherein the plurality of apertures are distributed in a plurality of concentric patterns, and wherein the plurality of concentric apertures are arranged alternately with the plurality of concentric patterns.

17. The zone plate as claimed in any one of claims 1 to 16, wherein the mask layer comprises at least one of a metal, a semiconductor or a polymer.

18. The zone plate as claimed in any one of claims 1 to 17, further comprising:

a substrate, wherein the mask layer is arranged over the substrate, and

wherein the substrate is at least substantially transmissive to the electromagnetic radiation.

19 A microscope comprising a zone plate as claimed in any one of claims 1 to 18.

20. An imaging device comprising:

a source configured to provide an electromagnetic radiation; and

a zone plate as claimed in any one of claims 1 to 18, the zone plate arranged to diffract the electromagnetic radiation and focus the diffracted electromagnetic radiation for imaging an object.