CLAIMS

1. A cancer cell-trapping metal filter having a through-hole that is formed in a thickness direction of a metal sheet in which a main component is composed of a metal,

wherein an opening of the through-hole has a wave shape.

2. The cancer cell-trapping metal filter according to claim 1,

wherein a plurality of the through-holes are arranged.

3. The cancer cell-trapping metal filter according to claim 1 or 2,

wherein an opening ratio of the opening is 10% to 50%.

4. The cancer cell-trapping metal filter according to any one of claims 1 to 3,

wherein a surface of the metal sheet is plated with gold.

5. A cancer cell-trapping metal filter sheet, comprising:

a plurality of filtration portions having a through-hole formed in a thickness direction of a metal sheet in which a main component is composed of a metal; and

a connection portion that is provided between two adjacent filtration portions that are included in the plurality of filtration portions,

wherein a plurality of the through-holes, which have an wave-shaped opening, are formed in the filtration portion.

6. The cancer cell-trapping metal filter sheet according to claim 5,

wherein an opening ratio of the opening in the filtration portion is 10% to 50%.

7. The cancer cell-trapping metal filter sheet according to claim 5 or 6,

wherein a positioning hole is formed in the connection portion.

8. The cancer cell-trapping metal filter sheet according to any one of

claims 5 to 7,

wherein a surface of the metal sheet is plated with gold.

9. A cancer cell-trapping device, comprising:

a casing that includes a cover member which is formed from a light-transmitting resin material and which has an inlet channel from which a liquid to be tested is introduced to the inside of the casing, and an accommodation member that has an outlet channel through which the liquid to be tested is discharged to the outside of the casing; and

the cancer cell-trapping metal filter according to any one of claims 1 to 4 which is provided on a flow path inside the casing between the inlet channel and the outlet channel in such a manner that the liquid to be tested flows through the through-hole.

10. The cancer cell-trapping device according to claim 9,

wherein a hole diameter of the through-hole in a main surface on an upstream side is smaller than a hole diameter on a rear surface side with respect to the main surface.

11. The cancer cell-trapping device according to claim 9 or 10,

wherein instead of the cancer cell-trapping metal filter, a cancer cell-tapping metal filter member, which includes a filtration portion having a through-hole formed in a thickness direction of a metal sheet in which a main component is composed of a metal, and a connection portion having a positioning hole formed at the periphery of the filtration portion, is provided, and

at least one of the cover member and the accommodation member is provided with a protrusion that is inserted into the positioning hole at a position corresponding to the positioning hole

when the cancer cell-trapping metal filter member is mounted.

12. The cancer cell-trapping device according to any one of claims 9 to 11,

wherein the cover member and the accommodation member are welded to each other.

13. A method of manufacturing a cancer cell-trapping metal filter, comprising:

a process of laminating a photoresist on metal foil;

a process of overlapping a photomask including a wave-shaped light-transmitting portion on the photoresist and exposing the photoresist;

a process of removing an uncured portion of the photoresist by development to form photoresist patterns;

a process of performing metal plating between the photoresist patterns to form metal plating patterns having a height lower than a height of the photoresist patterns;

a process of removing the metal foil by chemical dissolution to obtain a structure including the metal plating patterns and the photoresist patterns; and

a process of removing the photoresist patterns from the structure to obtain the metal plating patterns having a through-hole corresponding to the light-transmitting portion.

14. The method of manufacturing a cancer cell-trapping metal filter according to claim 13,

wherein the metal foil is adhered to a carrier layer, and

the method further comprises a process of peeling the carrier

layer after the process of forming the metal plating patterns.

15. The method of manufacturing a cancer cell-trapping metal filter according to claim 13 or 14,

wherein an opening ratio of an opening is 10% to 50%.

16. The method of manufacturing a cancer cell-trapping metal filter according to any one of claims 11 to 15, further comprising:

a process of plating a surface of the metal plating patterns with gold after the process of obtaining the metal plating patterns.

17. A method of manufacturing a cancer cell-trapping metal filter sheet, comprising:

a process of laminating a photoresist on metal foil;

a process of overlapping a photomask including a plurality of blocks of wave-shaped light-transmitting portions on the photoresist and exposing the photoresist;

a process of removing an uncured portion of the photoresist by development to form photoresist patterns;

a process of performing metal plating between the photoresist patterns to form metal plating patterns having a height lower than a height of the photoresist patterns;

a process of removing the metal foil by chemical dissolution to obtain a structure including the metal plating patterns and the photoresist patterns; and

a process of removing the photoresist patterns from the structure to obtain the metal plating patterns having a through-hole corresponding to the light-transmitting portion.

18. The method of manufacturing a cancer cell-trapping metal filter

sheet according to claim 17,

wherein the metal foil is adhered to a carrier layer, and

the method further comprises a process of peeling the carrier layer after the process of forming the metal plating patterns.

19. The method of manufacturing a cancer cell-trapping metal filter sheet according to claim 17 or 18,

wherein in the process of overlapping the photomask on the photoresist and exposing the photoresist, a photomask, which includes a second light-transmitting portion different from the light-transmitting portion at the periphery of the blocks of the wave-shaped light-transmitting portions, is used.

20. The method of manufacturing a cancer cell-trapping metal filter sheet according to any one of claims 17 to 19,

wherein an opening ratio of an opening is 10% to 50%.

21. The method of manufacturing a cancer cell-trapping metal filter sheet according to any one of claims 17 to 20, further comprising:

a process of plating a surface of the metal plating patterns with gold after the process of obtaining the metal plating patterns.

22. A method of manufacturing a cancer cell-trapping device, comprising:

a process of providing the cancer cell-trapping metal filter according to any one of claims 1 to 4 on a flow path inside a casing between an inlet channel and an outlet channel in such a manner that a hole diameter of the through-hole in a main surface on an upstream side becomes smaller than a hole diameter on a rear surface side with respect to the main surface, the casing including a cover member which is

formed from a light-transmitting resin material and which has the inlet channel from which a liquid to be tested is introduced to the inside of the casing, and an accommodation member that includes the outlet channel through which the liquid to be tested is discharged to the outside of the casing.

23. The method of manufacturing a cancer cell-trapping device according to claim 22,

wherein the cover member and the accommodation member are welded to each other.

CLAIMS

1. A cancer cell-trapping metal filter having a through-hole that is formed in a thickness direction of a sheet mainly composed of a metal,

wherein an opening of the through-hole has a wave shape.

2. The cancer cell-trapping metal filter according to claim 1,

wherein a plurality of the through-holes are arranged.

3. The cancer cell-trapping metal filter according to claim 1 or claim 2,

wherein an opening ratio of the opening is 10% to 50%.

4. The cancer cell-trapping metal filter according to any one of claims 1 to 3,

wherein a surface of the sheet mainly composed of a metal is plated with gold.

5. A cancer cell-trapping metal filter sheet, comprising:

a plurality of filtration portions having a through-hole formed in a thickness direction of a sheet mainly composed of a metal; and

a connection portion that is provided between two adjacent filtration portions that are included in the plurality of filtration portions,

wherein a plurality of the through-holes, which have an wave-shaped opening, are formed in the filtration portion.

6. The cancer cell-trapping metal filter sheet according to claim 5,

wherein an opening ratio of the opening in the filtration portion is 10% to 50%.

7. The cancer cell-trapping metal filter sheet according to claim 5 or claim 6,

wherein a positioning hole is formed in the connection portion.

8. The cancer cell-trapping metal filter sheet according to any one of claims 5 to 7,

wherein a surface of the sheet mainly composed of a metal is plated with gold.

9. A cancer cell-trapping device, comprising:

a casing that includes a cover member which is formed from a light-transmitting resin material and which has an inlet channel from which a liquid to be tested is introduced to the inside of the casing, and an accommodation member that has an outlet channel through which the liquid to be tested is discharged to the outside of the casing; and

the cancer cell-trapping metal filter according to any one of claims 1 to 4 which is provided on a flow path inside the casing between the inlet channel and the outlet channel in such a manner that the liquid to be tested flows through the through-hole.

10. The cancer cell-trapping device according to claim 9,

wherein a hole diameter of the through-hole in a main surface on an upstream side is smaller than a hole diameter on a rear surface side with respect to the main surface.

11. The cancer cell-trapping device according to claim 9 or claim 10,

wherein instead of the cancer cell-trapping metal filter, a cancer cell-trapping metal filter member, which includes a filtration portion having a through-hole with a wave shaped opening formed in a thickness direction of a sheet mainly composed of a metal, and a connection portion having a positioning hole formed at the periphery of the filtration portion, is provided, and

at least one of the cover member and the accommodation

member is provided with a protrusion that is inserted into the positioning hole at a position corresponding to the positioning hole when the cancer cell-trapping metal filter member is mounted.

12. The cancer cell-trapping device according to any one of claims 9 to 11,

wherein the cover member and the accommodation member are welded to each other.

13. A method of manufacturing a cancer cell-trapping metal filter, comprising:

a process of laminating a photoresist on metal foil;

a process of overlapping a photomask including a wave-shaped light-transmitting portion on the photoresist and exposing the photoresist;

a process of removing an uncured portion of the photoresist by development to form photoresist patterns;

a process of performing metal plating between the photoresist patterns to form metal plating patterns having a height lower than a height of the photoresist patterns;

a process of removing the metal foil by chemical dissolution to obtain a structure including the metal plating patterns and the photoresist patterns; and

a process of removing the photoresist patterns from the structure to obtain the metal plating patterns having a through-hole corresponding to the light-transmitting portion.

14. The method of manufacturing a cancer cell-trapping metal filter according to claim 13,

wherein the metal foil is adhered to a carrier layer, and

the method further comprises a process of peeling the carrier layer after the process of forming the metal plating patterns.

15. The method of manufacturing a cancer cell-trapping metal filter according to claim 13 or claim 14,

wherein an opening ratio of an opening is 10% to 50%.

16. The method of manufacturing a cancer cell-trapping metal filter according to any one of claims 13 to 15, further comprising:

a process of plating a surface of the metal plating patterns with gold after the process of obtaining the metal plating patterns.

17. A method of manufacturing a cancer cell-trapping metal filter sheet, comprising:

a process of laminating a photoresist on metal foil;

a process of overlapping a photomask including a plurality of blocks of wave-shaped light-transmitting portions on the photoresist and exposing the photoresist;

a process of removing an uncured portion of the photoresist by development to form photoresist patterns;

a process of performing metal plating between the photoresist patterns to form metal plating patterns having a height lower than a height of the photoresist patterns;

a process of removing the metal foil by chemical dissolution to obtain a structure including the metal plating patterns and the photoresist patterns; and

a process of removing the photoresist patterns from the structure to obtain the metal plating patterns having a through-hole corresponding

to the light-transmitting portion.

18. The method of manufacturing a cancer cell-trapping metal filter sheet according to claim 17,

wherein the metal foil is adhered to a carrier layer, and

the method further comprises a process of peeling the carrier layer after the process of forming the metal plating patterns.

19. The method of manufacturing a cancer cell-trapping metal filter sheet according to claim 17 or claim 18,

wherein in the process of overlapping the photomask on the photoresist and exposing the photoresist, a photomask, which includes a second light-transmitting portion different from the light-transmitting portion at the periphery of the blocks of the wave-shaped light-transmitting portions, is used.

20. The method of manufacturing a cancer cell-trapping metal filter sheet according to any one of claims 17 to 19,

wherein an opening ratio of an opening is 10% to 50%.

21. The method of manufacturing a cancer cell-trapping metal filter sheet according to any one of claims 17 to 20, further comprising:

a process of plating a surface of the metal plating patterns with gold after the process of obtaining the metal plating patterns.

22. A method of manufacturing a cancer cell-trapping device, comprising:

a process of providing the cancer cell-trapping metal filter according to any one of claims 1 to 4, on a flow path inside a casing between an inlet channel and an outlet channel in such a manner that a hole diameter of the through-hole in a main surface on an upstream side

becomes smaller than a hole diameter on a rear surface side with respect to the main surface, the casing including a cover member which is formed from a light-transmitting resin material and which has the inlet channel from which a liquid to be tested is introduced to the inside of the casing, and an accommodation member that includes the outlet channel through which the liquid to be tested is discharged to the outside of the casing.

23. The method of manufacturing a cancer cell-trapping device according to claim 22,

wherein the cover member and the accommodation member are welded to each other.