CLAIMS

[Claim 1]

A Ni-based alloy member comprising a Ni-based alloy,

(1) wherein the Ni-based alloy comprises:

(a) Cr in the range of ~~14.5~~18.0 mass% to ~~24.5~~22.5 mass%;

(b) Mo in the range of 12.0 mass% to 23.0 mass%; and

(c) ~~Ni greater than 24.5 mass%;~~Ni at the largest content by a mass ratio; and Cr and Mo at second largest contents by a mass ratio,

(2) wherein the Ni-based alloy member is an additively manufactured body, and comprises segregation of Mo in at least a part of a crystal grain(s);

(3) wherein the crystal grain(s) has columnar cell structures, and the segregation of Mo exists between the adjacent columnar cell structures;

(4) wherein a Mo concentration in the segregation of Mo is higher than a Mo concentration in a mother phase in the crystal grain(s) by 3 at% or higher; and

(5) wherein the additively manufactured body has:

(a) a Vickers hardness of the Ni-based alloy member is 200 HV10 or higher;

(b) a tensile strength of the Ni-based alloy member is 850 MPa or higher; and

(c) a yield strength of 400 MPa or higher, and (6) wherein the additively manufactured body has an oxide film which contains Cr as a constituent element, on its surface layer, and the oxide film has a thickness of 1nm to 6nm.

[Claim 2]

The Ni-based alloy member according to claim 1, wherein

an average diameter of equivalent circle diameters in cross sections of the columnar cell structures is 1000 nm or smaller.

[Claim 3]

The Ni-based alloy member according to claim 1 or 2, wherein

when the cross sections of the columnar cell structures are observed with a transmission electron microscope, a dislocation density that is obtained by dislocation length/assessed volume is 10^{12} m^{-2} or higher, wherein

the assessed volume is observation area × sample thickness.

[Claim 4]

The Ni-based alloy member according to any one of claims 1 to 3, wherein

a mean grain size of the crystal grains is 80 to 150 μm.

[Claim 5]

The Ni-based alloy member according to any one of claims 1 to 4, wherein

an elongation of the Ni-based alloy member is 50% or higher.

[Claim 6]

The Ni-based alloy member according to any one of claims 1 to 5, wherein

the Ni-based alloy further comprises Ta in the range of 1.0 mass% to 2.5 mass%.

[Claim 7]

The Ni-based alloy member according to any one of claims 1 to 6, wherein

the Ni-based alloy further comprises W in the range of 2 mass% to 5 mass%.

[Claim 8]

A manufactured product using the Ni-based alloy member according to any one of claims 1 to 7.

[Claim 9]

The manufactured product according to claim 8, wherein

the manufactured product is a semiconductor manufacturing apparatus.

[Claim 10]

A method for manufacturing a Ni-based alloy member comprising a step of obtaining an additively manufactured body including a Ni-based alloy by additive manufacturing using a laser beam or an electron beam,

(1) wherein the Ni-based alloy comprises:

(a) Cr in the range of ~~14.5~~18.0 mass% to ~~24.5~~22.5 mass%;

(b) Mo in the range of 12.0 mass% to 23.0 mass%; and

(c) ~~Ni greater than 24.5 mass%;~~Ni at the largest content by a mass ratio; and Cr and Mo at second largest contents by a mass ratio,

(2) wherein during melting and solidification in the additive manufacturing, a crystal grain(s) having columnar cell structures is formed, and segregation of Mo is formed between the adjacent columnar cell structures in an inner part of the crystal grain(s); and

(3) wherein, to not vanish the segregation of Mo, the additively manufactured body is subjected to ~~one of either:~~no heat treatment, and

~~(a) no heat treatment;~~

~~(b) heat treatment within the range of 800°C or higher and 1200°C or lower; or~~

~~(c) aging heat treatment within the range of 600°C or higher and lower than 800°C.~~

(4) the step of obtaining the additively manufactured body is conducted in a shielding gas with the content of oxyden is 10 to 2000ppm,

and

thus obtained additively manufactured body has an oxide film which contains Cr as a constituent element, on its surface layer.

[Claim 11]

The method for manufacturing a Ni-based alloy member according to claim 10, wherein a Mo concentration in the segregation of Mo is higher than a Mo concentration in a mother phase in the crystal grain(s) by 3 at% or higher~~;~~.

[Claim 12]

The method for manufacturing a Ni-based alloy member according to claim 10, wherein the additively manufactured body has:

(1) a Vickers hardness of the Ni-based alloy member is 200 HV10 or higher;

(2) a tensile strength of the Ni-based alloy member is 850 MPa or higher; and

(3) a yield strength of 400 MPa or higher.

[Claim 13]

The method for manufacturing a Ni-based alloy member according to claim 10, wherein

an average diameter of equivalent circle diameters in cross sections of the columnar cell structures is 1000 nm or smaller.

[Claim 14]

~~The method for manufacturing a Ni-based alloy member according to claim 10, wherein~~

~~the heat treatment is performed; and~~

~~the heat treatment is performed within the range of 0.5 hours or longer and 3 hours or shorter.~~

~~[Claim 15]~~

~~The method for manufacturing a Ni-based alloy member according to claim 10, wherein~~

~~the aging heat treatment is performed; and~~

~~the aging heat treatment is performed within the range of 20 hours or longer and 100 hours or shorter.~~

~~[Claim 16]~~

The method for manufacturing a Ni-based alloy member according to any one of claims 10 to ~~15~~13, wherein the Ni-based alloy further comprises Ta in the range of 1 mass% to 2.5 mass%.

[Claim ~~17~~15]

The method for manufacturing a Ni-based alloy member according to any one of claims 10 to ~~16~~14, wherein the Ni-based alloy further comprises W in the range of 2 mass% to 5 mass%.

[Claim 16]

A method for manufacturing a Ni-based alloy member comprising a step of obtaining an additively manufactured body including a Ni-based alloy by additive manufacturing using a laser beam or an electron beam,

(1) wherein the Ni-based alloy comprises:

(a) Cr in the range of 14.5 mass% to 24.5 mass%;

(b) Mo in the range of 12.0 mass% to 23.0 mass%; and

(c) Ni at the largest content by a mass ratio; and Cr and Mo at second largest contents by mass ratio;

(2) wherein during melting and solidification in the additive manufacturing, a crystal grain(s) having columnar cell structures is formed, and segregation of Mo

is formed between the adjacent columnar cell structures in an inner part of the crystal grain(s); and

(3) wherein, to not vanish the segregation of Mo, the additively manufactured body is subjected to one of either:

(a) heat treatment within the range of 800°C or higher and 1200°C or lower and within the range of 0.5 hours or longer and 3 hours or shorter; or

(b) aging heat treatment within the range of 600°C or higher and lower than 800°C and within the range of 20 hours or longer and 100 hours or shorter.