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 18.0 mass% to 22.5 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 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 18.0 mass% to 22.5 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 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 no heat treatment, and

(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 any one of claims 10 to 13, wherein

the Ni-based alloy further comprises Ta in the range of 1 mass% to 2.5 mass%.

[Claim 15]

The method for manufacturing a Ni-based alloy member according to any one of claims 10 to 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.