[Claims]

[Claim 1]

A semiconductor device comprising:

a stacked body including:

a first stacked portion including a plurality of electrode layers stacked in a first direction via an insulator;

a second stacked portion including a plurality of electrode layers stacked in the first direction via an insulator and being disposed separately from the first stacked portion in the first direction; and

a connection portion including a high dielectric layer provided between the first stacked portion and the second stacked portion, and having a dielectric constant higher than a dielectric constant of the insulator; and

a column-shaped portion including:

a first portion provided in the first stacked portion and extending in the first direction;

a second portion provided in the second stacked portion and extending in the first direction; and

an intermediate portion provided in the connection portion and connected the first portion to the second portion,

the connection portion includes an insulating layer between the high dielectric layer and the second stacked portion, and

a maximum diameter of a portion, which is surrounded by the high dielectric layer, of the intermediate portion is smaller than a diameter of a lower end of the first portion when viewed from the first direction.

[Claim 2]

The device according to claim 1, wherein the high dielectric layer is provided in the entire connection portion.

[Claim 3]

A semiconductor device comprising:

a stacked body including:

a first stacked portion including a plurality of electrode layers stacked in a first direction via an insulator;

a second stacked portion including a plurality of electrode layers stacked in the first direction via an insulator and being disposed separately from the first stacked portion in the first direction; and

a connection portion including a high dielectric layer provided between the first stacked portion and the second stacked portion, and having a dielectric constant higher than a dielectric constant of the insulator; and

a column-shaped portion including:

a first portion provided in the first stacked portion and extending in the first direction;

a second portion provided in the second stacked portion and extending in the first direction; and

an intermediate portion provided in the connection portion and connected the first portion to the second portion,

a maximum diameter of the intermediate portion being larger than a diameter of a lower end of the second portion when viewed from the first direction.

[Claim 4]

A semiconductor device comprising:

a stacked body including:

a first stacked portion including a plurality of electrode layers stacked in a first direction via an insulator;

a second stacked portion including a plurality of electrode layers stacked in the first direction via an insulator and being disposed separately from the first stacked portion in the first direction; and

a connection portion including a high dielectric layer provided between the first stacked portion and the second stacked portion, and having a dielectric constant higher than a dielectric constant of the insulator; and

a column-shaped portion including:

a first portion provided in the first stacked portion and extending in the first direction;

a second portion provided in the second stacked portion and extending in the first direction; and

an intermediate portion provided in the connection portion and connected the first portion to the second portion,

the high dielectric layer including at least one selected from the group consisting of a hafnium oxide, an aluminum oxide, a silicon carbonitride, and a zirconium oxide.

[Claim 5]

A semiconductor device comprising:

a stacked body including:

a first stacked portion including a plurality of electrode layers stacked in a first direction via an insulator;

a second stacked portion including a plurality of electrode layers stacked in the first direction via an insulator and being disposed separately from the first stacked portion in the first direction; and

a connection portion including a high dielectric layer provided between the first stacked portion and the second stacked portion, and having a dielectric constant higher than a dielectric constant of the insulator; and

a column-shaped portion including:

a first portion provided in the first stacked portion and extending in the first direction;

a second portion provided in the second stacked portion and extending in the first direction; and

an intermediate portion provided in the connection portion and connected the first portion to the second portion,

a thickness of the high dielectric layer being greater than a thickness of the insulator in the first direction.

[Claim 6]

The device according to claim 1, wherein the column-shaped portion includes:

a semiconductor body extending in the first direction; and

a charge storage portion provided between the semiconductor body and the first stacked portion, and between the semiconductor body and the second stacked portion.

[Claim 7]

The device according to claim 6, wherein the semiconductor body has a corner portion surrounded by the connection portion.

[Claim 8]

A semiconductor device comprising:

a stacked body including:

a first electrode layer;

a connection portion provided on the first electrode layer via a first insulator, the connection portion including a high dielectric layer having a dielectric constant higher than a dielectric constant of the first insulator; and

a second electrode layer provided on the connection portion via a second insulator; and

first and second column-shaped portions provided adjacent to each other in the stacked body, and extending in a first direction of the stacked body,

a shortest distance between the first and second column-shaped portions in a portion surrounded by the connection portion being shorter than a shortest distance between the first and second column-shaped portions in a portion surrounded by the second insulator.

[Claim 9]

The device according to claim 8, wherein the high dielectric layer is provided in the entire connection portion.

[Claim 10]

The device according to claim 8, wherein

the connection portion includes an insulating layer between the high dielectric layer and the second insulator, and

a shortest distance between the first and second column-shaped portions in a portion surrounded by the high dielectric layer is

longer than a shortest distance between the first and second column-shaped portions in a portion surrounded by the first insulator.

[Claim 11]

The device according to claim 8, wherein the high dielectric layer includes a hafnium oxide.

[Claim 12]

The device according to claim 8, wherein a thickness of the high dielectric layer is greater than a thickness of the first insulator and a thickness of the second insulator.

[Claim 13]

The device according to claim 8, further comprising:

a semiconductor body provided in the column-shaped portion and extending in the first direction; and

a charge storage portion provided between the semiconductor body and the first electrode layer, and between the semiconductor body and the second electrode layer.

[Claim 14]

The device according to claim 13, wherein the semiconductor body has a corner portion surrounded by the connection portion.

[Claim 15]

A method of manufacturing a semiconductor device, comprising:

forming a first stacked portion including a plurality of replacement members stacked via an insulator;

forming a connection portion on the first stacked portion, the connection portion including a high dielectric layer having a dielectric constant higher than a dielectric constant of the insulator;

forming a first hole penetrating the connection portion and the first stacked portion;

forming a sacrificial film in the first hole;

forming a second stacked portion on the connection portion and on the sacrificial film, the second stacked portion including a plurality of replacement members stacked via the insulator;

forming a second hole penetrating the second stacked portion and reaching the sacrificial film;

removing the sacrificial film through the second hole; and

forming a column-shaped portion on a side wall of the first hole and a side wall of the second hole.

[Claim 16]

The method according to claim 15, wherein the forming of the sacrificial film includes:

forming a first sacrificial film in the first hole from an interior of the first stacked portion to a portion of an interior of the connection portion,

forming a recessed portion by recessing a side surface of the connection portion exposed to the first hole; and

forming a second sacrificial film on the recessed portion.

[Claim 17]

The method according to claim 15, further comprising recessing side surfaces of the plurality of replacement members through the first hole and the second hole after the removing of the sacrificial film.

[Claim 18]

The method according to claim 17, wherein the recessing of the side surfaces of the plurality of replacement members includes:

supplying an oxidizing agent into the first hole and the second hole; and

introducing an etchant into the first hole and the second hole.

[Claim 19]

The method according to claim 15, wherein the forming of the connection portion includes forming the high dielectric layer with a thickness greater than a thickness of the insulator.