WHAT IS CLAIMED IS:

1. An etching apparatus comprising:

a processing container configured to form a vacuum atmosphere in the processing container when evacuated and including a wall constructed using an alloy composed of aluminum and an additive metal as a base material of the wall of the processing container;

a stage installed in the processing container and configured to mount a substrate having a metal film formed on a surface of the substrate;

a gas supplier installed in the processing container and configured to supply an oxidizing gas that oxidizes the metal film and an etching gas that is β-diketone to the stage to etch the oxidized metal film; and

a wall heater which is capable of heating the wall to a temperature in a range of 60 degrees C to 90 degrees C,

wherein a base material of the stage is an alloy composed of aluminum and an additive metal, and a top surface and a side surface of the stage are constituted with a stage covering portion which covers the base material of the stage so as to prevent the additive metal of the base material of the stage from being released to the substrate and which includes a top surface covering portion made of silicon to cover the top surface of the stage.

2. The etching apparatus of Claim 1, wherein the wall heated by the wall heater includes a ceiling wall of the processing container.

3. The etching apparatus of Claim 2, wherein a plurality of stages is installed,

the etching apparatus further comprises a partition wall extending downward from the ceiling wall and surrounding each of the plurality of stages, and a partition wall heater configured to heat the partition wall,

the gas supplier forms the ceiling wall and is configured to supply the etching gas and the oxidizing gas to a processing space surrounded by the partition wall, and

the wall heated by the wall heater includes the ceiling wall and a side wall of the processing container.

4. The etching apparatus of Claim 3, wherein a base material of the partition wall is an alloy composed of aluminum and an additive metal, and

an inner wall surface of the partition wall is constituted with a covering portion for the partition wall that covers the base material of the partition wall so as to prevent the additive metal of the base material of the partition wall from being released to the substrate.

5. The etching apparatus of Claim 4, wherein the base material of the partition wall is one of JIS A5052, JIS A5083, JIS A5154, JIS A6061, and JIS A6082 and

the covering portion for the partition wall is made of silicon.

6. The etching apparatus of any one of Claims 1 to 5, wherein a base material of the gas supplier is made of one of JIS A5052, JIS A5083, JIS A5154, JIS A6061, and JIS A6082, and is provided with a covering portion for the gas supplier that covers a surface of the base material of the gas supplier so as to prevent release of an additive metal of the base material of the gas supplier to the substrate, or

the base material of the gas supplier is made of one of JIS A1050, JIS A1070, and JIS A1080.

7. The etching apparatus of Claim 6, wherein the gas supplier is a shower head, and the base material of the gas supplier is made of one of JIS A1050, JIS A1070, and JIS A1080.

8. The etching apparatus of Claim 1, wherein the base material of the stage is one of JIS A5052, JIS A5083, JIS A5154, JIS A6061, and JIS A6082, and

wherein the stage covering portion further includes:

a side surface covering portion made of one of JIS A1050, JIS A1070, and JIS A1080 to cover the side surface of the stage.

9. The etching apparatus of any one of Claims 1 to 8, wherein the base material of the wall of the processing container is one of JIS A5052, JIS A5083, JIS A5154, JIS A6061, and JIS A6082.

10. The etching apparatus of any one of Claims 1 to 9, further comprising:

an etching gas reservoir configured to store the etching gas outside the processing container; and

a flow path formation portion connecting the etching gas reservoir and the processing container to form a flow path, and configured to supply the etching gas to the gas supplier,

wherein the flow path formation portion is made of an alloy containing nickel, chrome, and molybdenum as main constituent metals.

11. The etching apparatus of any one of Claims 1 to 10, wherein the etching gas is hexafluoroacetylacetone gas.

12. An etching method comprising:

forming a vacuum atmosphere by evacuating an inside of a processing container having a wall that has a base material of which is an alloy made of aluminum and an additive metal;

mounting a substrate, having a metal film formed on a surface of the substrate, on a stage installed the processing container;

supplying an oxidizing gas that oxidizes the metal film and an etching gas that is β-diketone to the stage from a gas supplier installed in the processing container so as to etch the oxidized metal film; and

heating the wall to a temperature in a range of 60 degrees C to 90 degrees C when the etching gas is supplied from the gas supplier into the processing container by a wall heater,

wherein a base material of the stage is an alloy composed of aluminum and an additive metal, and a top surface and a side surface of the stage are constituted with a stage covering portion which covers the base material of the stage so as to prevent the additive metal of the base material of the stage from being released to the substrate and which includes a top surface covering portion made of silicon to cover the top surface of the stage.

13. The etching method of Claim 12, further comprising:

exposing the inside of the processing container to a gas containing fluorine for 12 hours or longer before processing the substrate.