CLAIMS

[Claim 1]

An etching method comprising:

placing a substrate having SiGe or Ge on a surface thereof in a chamber;

supplying an etching gas for etching SiGe or Ge to the substrate maintained at a first temperature at which no etching reaction occurs and adsorbing the etching gas onto the surface of the substrate; and

changing the temperature of the substrate to a second temperature at which reaction between the SiGe or Ge and the etching gas occurs and etching the SiGe or Ge.

[Claim 2]

The etching method of claim 1, wherein the adsorption of the etching gas onto the surface of the substrate and the etching are repeated multiple times.

[Claim 3]

The etching method of claim 1, further comprising:

exhausting the etching gas from the chamber after the adsorption of the etching gas onto the surface of the substrate.

[Claim 4]

The etching method of claim 3, wherein the exhaust of the etching gas from the chamber is achieved by purging the chamber with an inert gas.

[Claim 5]

The etching method of claim 1, further comprising, after the etching:

evacuating residues generated by the etching from the chamber.

[Claim 6]

The etching method of claim 5, wherein the evacuation of the residues from the chamber is performed by evacuating the chamber.

[Claim 7]

The etching method of any one of claims 1 to 6, wherein the substrate contains Si at a portion to be brought into contact with the etching gas during processing, and the SiGe or Ge is selectively etched relative to the Si.

[Claim 8]

The etching method of claim 7, wherein the SiGe or Ge is a SiGe film or a Ge film, and the Si is a Si film.

[Claim 9]

The etching method of claim 8, wherein the substrate has a laminated structure in which the SiGe film and the Si film are alternately stacked on a surface thereof.

[Claim 10]

The etching method of claim 7, wherein the etching gas is a fluorine-containing gas.

[Claim 11]

The etching method of claim 10, wherein the fluorine-containing gas is at least one of ClF_3 gas, F_2 gas, SF_6 gas, or IF_7 gas.

[Claim 12]

The etching method of claim 10, wherein when a fluorine-containing gas is used as the etching gas, the first temperature is -20°C or lower, and the second temperature is higher than the first temperature.

[Claim 13]

The etching method of claim 12, wherein the second temperature is room temperature or lower.

[Claim 14]

The etching method of claim 1, wherein when the etching gas is adsorbed onto the surface of the substrate, an inert gas is supplied to the substrate together with the etching gas.

[Claim 15]

An etching apparatus comprising:

a chamber accommodating a substrate having SiGe or Ge on a surface thereof;

a placing table configured to place a substrate thereon in the chamber;

a gas supply unit configured to supply an etching gas into the chamber;

an exhaust unit configured to exhaust the chamber;

a temperature control unit configured to control a temperature of the substrate on the placing table; and

a controller;

wherein the controller controls the gas supply unit, the exhaust unit, and the temperature control unit to perform the etching method described in any one of claims 1 to 14.