CLAIMS

[1] An etching liquid for use in a step of removing a silicon nitride film from a substrate having the silicon nitride film and a silicon oxide film,

wherein the etching liquid is obtained by blending a solution containing silica and an alkali, phosphoric acid, water together and a high-temperature stabilizing agent having a pKa value of 2 or less, and

wherein a ratio of the mass of phosphoric acid (M2) to the mass of the high-temperature stabilizing agent (M1) (a mass ratio M2 / M1) is 800 or more.

[2] The etching liquid according to claim 1,

wherein the solution is a silica solution in which at least a part of the silica is dissolved in the alkali.

[3] The etching liquid according to claim 2,

wherein silica before being dissolved in the alkali is at least one selected from fumed silica and colloidal silica.

[4] The etching liquid according to claim 2 or 3,

wherein the content of silica dissolved in the etching liquid is 0.0005 mass% to 1 mass% inclusive.

[5] The etching liquid according to any of claims 1 to 4,

wherein the alkali is an organic alkali or an inorganic alkali.

[6] The etching liquid according to any of claims 1 to 5,

wherein the alkali is at least one selected from tetramethylammonium hydroxide, tetraethylammonium hydroxide, trimethylethylammonium hydroxide, benzyltrimethylammonium hydroxide, ethyltrimethylammonium hydroxide, methylbenzyltrimethylammonium hydroxide, tetraethylammonium hydroxide, sodium hydroxide, and potassium hydroxide.

[7] The etching liquid according to claim 1,

wherein the high-temperature stabilizing agent having a pKa value of 2 or less is an organic acid having a pKa value of 2 or less.

[8] The etching liquid according to any of claims 1 to 7,

wherein the etching liquid further contains an organic phosphonic acid compound.

[9] The etching liquid according to claim 8,

wherein the organic phosphonic acid compound has a molecular weight of 150 or more.

[10] The etching liquid according to claim 8 or 9,

wherein the organic phosphonic acid compound is at least one selected from polyvinylphosphonic acids, alkylphosphonic acids, and alkyl ether phosphonic acids.

[11] The etching liquid according to any of claims 1 to 10,

wherein the etching liquid has a pH of 2 or less at 25°C.

[12] The etching liquid according to any of claims 1 to 11,

wherein the etching liquid has an etching temperature of 110°C to 180°C inclusive.

[13] The etching liquid according to any of claims 1 to 12,

wherein a flow rate of the etching liquid flowing through a filter is 10 g/ 3 min or more.

[14] An etching method comprising:

a step of removing a silicon nitride film from a substrate having the silicon nitride film and a silicon oxide film, using the etching liquid according to any of claims 1 to 13.

[15] A method for producing a semiconductor substrate, comprising:

a step of removing a silicon nitride film from a substrate having the silicon nitride film and a silicon oxide film, using the etching liquid according to any of claims 1 to 13.

[16] An additive agent to be added to an etching liquid for use in a step of removing a silicon nitride film from a substrate having the silicon nitride film and a silicon oxide film, the additive agent comprising:

a solution containing silica and an alkali.

[17] The additive agent according to claim 16, further comprising:

phosphoric acid.

[18] A kit for producing an etching liquid for use in a step of removing a silicon nitride film from a substrate having the silicon nitride film and a silicon oxide film, the kit comprising:

a solution containing silica and an alkali (a first liquid), and a solution containing phosphoric acid (a second liquid) in a state in which the first liquid and the second liquid are not mixed together,

wherein the first liquid and the second liquid are mixed together when the kit is used.