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, and 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~~ the amount of phosphoric acid blended into 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~~is 70 mass% or ~~3,~~more, and

~~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.

[2] The etching liquid according to claim 1,

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

[~~7~~3] 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.~~2,

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

~~[~~8[4] 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~~3,

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,~~

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

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~~[6] 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 5.

[7] 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.~~

~~[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.~~5.