CLAIMS

[Claim 1] An etchant for a process of removing a silicon nitride film from a substrate having a silicon nitride film and a silicon oxide film, the etchant comprising:

a siloxane compound modified with a compound having an alkyleneoxy group;

a phosphoric acid; and

water,

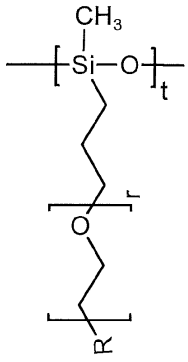
wherein a content of the phosphoric acid in the etchant is 50% by mass or more, and

a content of the siloxane compound is 0.01% by mass or more and 0.2% by mass or less, more.

[Claim 2] The etchant according to claim 1, wherein a siloxane compound modified with a compound having an alkyleneoxy group, a phosphoric acid, and water are blended to form the etchant.

[Claim 3] The etchant according to claim 1, wherein the siloxane compound modified with a compound having an alkyleneoxy group is a siloxane compound with a structure represented by the following formula (I):

[Chemical Formula 1]



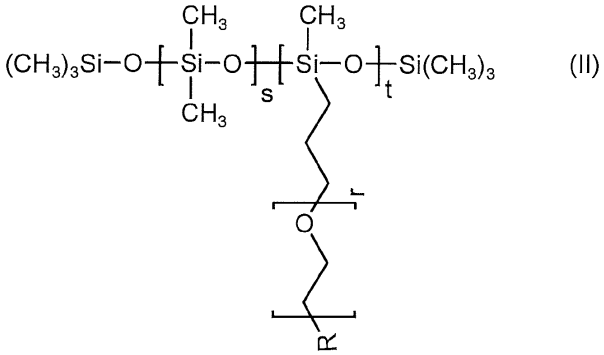
(I)

where R represents an alkyl group having 1 to 5 carbon atoms, a hydroxyalkyl group having 1 to 5 carbon atoms, an alkoxy group having 1

to 5 carbon atoms, or an anionic group, t represents 1 or more and 50 or less, and r represents 1 or more and 30 or less.

[Claim 4] The etchant according to claim 1, wherein the siloxane compound modified with a compound having an alkyleneoxy group is a siloxane compound represented by the following formula (II):

[Chemical Formula 2]



(II)

where R represents an alkyl group having 1 to 5 carbon atoms, a hydroxyalkyl group having 1 to 5 carbon atoms, an alkoxy group having 1 to 5 carbon atoms, or an anionic group, t / (s + t) × 100 is 4 or more, and r represents 1 or more and 30 or less.

[Claim 5] The etchant according to claim 3 or 4, wherein R in the formulas (I) and (II) is a methyl group, a methoxy group, or a phosphate group.

[Claim 6] The etchant according to claim 3 or 4, wherein R in the formulas (I) and (II) is a phosphate group.

[Claim 7] The etchant according to claim 1 or 2, having a pH of 2 or less.

[Claim 8] The etchant according to claim 1 or 2, for use in etching at an etching temperature of 110°C or more and 250°C or less.

[Claim 9] The etchant according to claim 1 or 2, wherein an HLB value of the siloxane compound modified with a compound having an alkyleneoxy group is 10 or more.

[Claim 10] An etching method comprising:

removing a silicon nitride film from a substrate having a silicon nitride film and a silicon oxide film by using the etchant according to claim 1 or 2.

[Claim 11] A method for producing a semiconductor substrate, the method comprising:

removing a silicon nitride film from a substrate having a silicon nitride film and a silicon oxide film by using the etchant according to claim 1 or 2,

wherein the substrate is used for a semiconductor.