CLAIMS

1. An etching gas comprising:

fluorobutene represented by a general formula $C_4H_xF_y$, in which x is 1 or more and 7 or less, y is 1 or more and 7 or less, and x + y is 8, wherein

the etching gas contains carbonyl fluoride as impurities and a concentration of carbonyl fluoride is 100 ppm by mass or less, and

wherein, a moisture concentration in the fluorobutene is 10 ppm by mass or less and an oxygen concentration in the fluorobutene is 100 ppm by mass or less.

2. The etching gas according to claim 1, further comprising hydrogen fluoride as the impurities, wherein

a concentration of hydrogen fluoride is 100 ppm by mass or less.

3. A method for producing the etching gas according to claim 1 or 2 comprising:

a dehydration step of applying dehydration treatment to crude fluorobutene which is the fluorobutene containing water and an oxygen gas; and

a deoxidizing gas step of applying deoxidizing gas treatment to the crude fluorobutene,

wherein, the dehydration treatment includes bringing the crude fluorobutene into contact with an adsorbent,

and the deoxidizing treatment includes distilling the crude flurobutene.

4. The method for producing the etching gas according to claim 3, wherein the deoxidizing gas step is performed after the dehydration step.

5. The method for producing the etching gas according to claim 3 or 4, wherein the dehydration treatment is treatment of bringing the crude fluorobutene into contact with the adsorbent to cause the adsorbent to adsorb the water.

6. The method for producing the etching gas according to any one of claims 3 to 5, further comprising:

a filling step of filling a filling vessel with the fluorobutene having undergone the dehydration step and the deoxidizing gas step.

7. An etching method comprising:

an etching step of bringing the etching gas according to claim 1 or 2 into contact with a member to be etched having an etching object which is an object to be etched by the etching gas and a non-etching object which is not an object to be etched by the etching gas, and selectively etching the etching object as compared with the non-etching object, wherein

the etching object contains silicon.

8. The etching method according to claim 7, wherein the etching gas is filled into a filling vessel, a gas phase part in the filling vessel has a concentration of carbonyl fluoride of 100 ppm by mass or less, and, in the etching step, the etching object is etched by extracting the gas phase part from the filling vessel and bringing the gas phase part into contact with the member to be etched.

9. The etching method according to claim 7 or 8, wherein the etching gas is a gas containing only the fluorobutene or a mixed gas containing the fluorobutene and a dilution gas.

10. The etching method according to claim 9, wherein the dilution gas is at least one selected from a nitrogen gas, helium, argon, neon, krypton, and xenon.

11. A method for producing a semiconductor device using the etching method according to any one of claims 7 to 10,

the member to be etched being a semiconductor substrate having the etching object and the non-etching object, the method comprising:

a treatment step of removing at least a part of the etching object from the semiconductor substrate by the etching.