WHAT IS CLAIMED IS:

1. A method of manufacturing a semiconductor device, comprising:

accommodating a substrate in a process chamber;

supplying a first gas containing oxygen into the process chamber;

generating plasma in the process chamber by exciting the first gas;

supplying a second gas containing hydrogen into the process chamber and adjusting a hydrogen concentration distribution in the process chamber according to a density distribution of the plasma in the process chamber; and

processing the substrate with oxidizing species generated by the plasma.

2. The method of Claim 1, wherein in generating the plasma, the plasma is generated so that the density distribution of the plasma in the process chamber is non-uniform in a plane direction of the substrate.

3. The method of Claim 1, wherein in supplying the first gas, the first gas is supplied to a first region in the process chamber, and

wherein in adjusting the hydrogen concentration distribution in the process chamber, the second gas is supplied to a second region which is a region above a processing surface of the substrate and is a region different from the first region in a plane direction of the substrate.

4. The method of Claim 1, wherein in supplying the first gas, the first gas is supplied to a plasma generation region where the plasma is generated,

wherein in adjusting the hydrogen concentration distribution in the process chamber, the second gas is supplied to a plasma non-generation region where the plasma is not generated.

5. The method of Claim 4, wherein a hydrogen concentration distribution in the plasma non-generation region is adjusted according to a distance from the plasma generation region.

6. The method of Claim 1, wherein the hydrogen concentration distribution in the process chamber is controlled by adjusting a supply flow rate of the second gas.

7. The method of Claim 1, wherein the hydrogen concentration distribution in the process chamber is controlled by adjusting a hydrogen content rate of the second gas.

8. The method of Claim 1, wherein a space in the process chamber includes an outer peripheral region along an inner wall of the process chamber and a central region surrounded by the outer peripheral region, and the plasma is generated so that a density of the plasma in the outer peripheral region is higher than a density of the plasma in the central region.

9. The method of Claim 8, wherein ring-shaped plasma along the inner wall of the process chamber is generated in the outer peripheral region.

10. The method of Claim 1, wherein in adjusting the hydrogen concentration distribution in the process chamber, the hydrogen concentration distribution in the process chamber is adjusted so that a density distribution of the oxidizing species supplied to the substrate is uniform in a plane direction on a surface of the substrate.

11. The method of Claim 1, wherein the first gas is a mixture of oxygen gas and hydrogen gas.

12. The method of Claim 1, wherein the second gas is a mixture of oxygen gas and hydrogen gas.

13. The method of Claim 11, wherein a hydrogen content rate of the first gas is different from a hydrogen content rate of the second gas.

14. A substrate processing apparatus comprising:

a process chamber in which a substrate is accommodated;

a first gas supply system configured to supply a first gas containing oxygen into the process chamber;

a second gas supply system configured to supply a second gas, which contains hydrogen, into the process chamber; and

a plasma generator configured to excite a gas in the process chamber to generate plasma, wherein a hydrogen concentration distribution in the process chamber is adjusted according to a density distribution of the plasma in the process chamber, and the substrate is processed with oxidizing species generated by the plasma.

15. The substrate processing apparatus of Claim 14, wherein the first gas supply system is configured to supply the first gas to a first region in the process chamber, wherein the second gas supply system is configured to supply the second gas to a second region in the process chamber, and wherein the second region is a region above a processing surface of the substrate and is a region different from the first region in a plane direction of the substrate.

16. The substrate processing apparatus of Claim 14, wherein a region in the process chamber to which the second gas is supplied is a region where the plasma is not generated.

17. A program that causes, by a computer, a substrate processing apparatus to perform a process comprising:

accommodating a substrate in a process chamber of the substrate processing apparatus;

supplying a first gas containing oxygen into the process chamber;

generating plasma in the process chamber by exciting the first gas;

supplying a second gas containing hydrogen into the process chamber and adjusting a hydrogen concentration distribution in the process chamber according to a density distribution of the plasma in the process chamber; and processing the substrate with oxidizing species generated by the plasma