WHAT IS CLAIMED IS:

1. A method of processing a substrate, comprising:

(a) supplying a first processing gas containing a first element and a halogen to the substrate, the first element including at least one selected from the group of zirconium (Zr), hafnium (Hf), molybdenum (Mo), ruthenium (Ru), aluminum (Al), gallium (Ga), silicon (Si), and germanium (Ge);

(b) supplying a second processing gas including a compound consisting of a N-N bond and a N-H bond to the substrate;

(c) supplying a fourth processing gas containing hydrogen and a second element different from the first element to the substrate during (a) and during a predetermined period after (a), the fourth processing gas being one of silane (SiH_4), disilane (Si_2H_6), trisilane (Si_3H_8), monoborane (BH_3), diborane (B_2H_6), and phosphine (PH_3); and

(d) performing (a), (b) and (c) X times, X being a natural number, in a state where the substrate is heated to a temperature of 250 degrees C or lower to form a first film containing the first element.

2. The method of processing the substrate according to Claim 1, wherein (d) is performed at a temperature of 180 degrees C or higher and 220 degrees C or lower.

3. The method of processing the substrate according to Claim 1, further comprising:

(e) supplying a third processing gas including the N-H bond and having a composition different from a composition of the second processing gas to the substrate; and

(f) performing (a) and (e) Y times, Y being a natural number, after (d) to form a second film containing the first element on the first film.

4. The method of processing the substrate according to Claim 2, further comprising:

(e) supplying a third processing gas including the N-H bond and having a composition

different from a composition of the second processing gas to the substrate; and

(f) performing (a) and (e) Y times, Y being a natural number, after (d) to form a second film containing the first element on the first film.

5. The method of processing the substrate according to Claim 1, further comprising (g) heat-treating the substrate at a temperature higher than the temperature of (d) after (d).

6. The method of processing the substrate according to Claim 2, further comprising (g) heat-treating the substrate at a temperature higher than the temperature of (d) after (d).

7. The method of processing the substrate according to Claim 3, further comprising (g) heat-treating the substrate at a temperature higher than the temperature of (d) after (d).

8. The method of processing the substrate according to Claim 1, further comprising (g) heat-treating the substrate at a temperature higher than the temperature of (d) after (d),

wherein a third processing gas including the N-H bond and having a composition different from a composition of the second processing gas is supplied to the substrate during temperature rise to the higher temperature.

9. The method of processing the substrate according to Claim 2, further comprising (g) heat-treating the substrate at a temperature higher than the temperature of (d) after (d),

wherein a third processing gas including the N-H bond and having a composition different from a composition of the second processing gas is supplied to the substrate during temperature rise to the higher temperature.

10. The method of processing the substrate according to Claim 3, further comprising (g) heat-treating the substrate at a temperature higher than the temperature of (d) after (d),

wherein the third processing gas including the N-H bond and having the composition different from the composition of the second processing gas is supplied to the substrate during temperature rise to the higher temperature.

11. The method of processing the substrate according to Claim 1, wherein in (b), a third processing gas including the N-H bond and having a composition different from a composition of the second processing gas is supplied.

12. The method of processing the substrate according to Claim 2, wherein in (b), a third processing gas including the N-H bond and having a composition different from a composition of the second processing gas is supplied.

13. The method of processing the substrate according to Claim 1, further comprising (h) supplying the fourth processing gas to the substrate after (d) to form a film containing the second element on the first film.

14. The method of processing the substrate according to Claim 1, wherein (b) is performed before (d).

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

(a) supplying a first processing gas containing a first element and a halogen to a substrate, the first element including at least one selected from the group of zirconium (Zr), hafnium (Hf), molybdenum (Mo), ruthenium (Ru), aluminum (Al), gallium (Ga), silicon (Si), and germanium (Ge);

(b) supplying a second processing gas including a compound consisting of a N-N bond and a N-H bond to the substrate;

(c) supplying a fourth processing gas containing hydrogen and a second element

different from the first element to the substrate during (a) and during a predetermined period after (a), the fourth processing gas being one of silane (SiH_4), disilane (Si_2H_6), trisilane (Si_3H_8), monoborane (BH_3), diborane (B_2H_6), and phosphine (PH_3); and

(d) performing (a), (b) and (c) X times, X being a natural number, in a state where the substrate is heated to a temperature of 250 degrees C or lower to form a first film containing the first element.

16. A program that causes, by a computer, a substrate processing apparatus to perform:

(a) supplying a first processing gas containing a first element and a halogen to a substrate, the first element including at least one selected from the group of zirconium (Zr), hafnium (Hf), molybdenum (Mo), ruthenium (Ru), aluminum (Al), gallium (Ga), silicon (Si), and germanium (Ge);

(b) supplying a second processing gas including a compound consisting of a N-N bond and a N-H bond to the substrate;

(c) supplying a fourth processing gas containing hydrogen and a second element different from the first element to the substrate during (a) and during a predetermined period after (a), the fourth processing gas being one of silane (SiH_4), disilane (Si_2H_6), trisilane (Si_3H_8), monoborane (BH_3), diborane (B_2H_6), and phosphine (PH_3); and

(d) performing (a), (b) and (c) X times, X being a natural number, while the substrate is heated to a temperature of 250 degrees C or lower to form a first film containing the first element.

17. A substrate processing apparatus comprising:

a first processing gas supply system that supplies a first processing gas containing a first element and a halogen to a substrate, the first element including at least one selected from the group of zirconium (Zr), hafnium (Hf), molybdenum (Mo), ruthenium (Ru), aluminum (Al), gallium (Ga), silicon (Si), and germanium (Ge);

a second processing gas supply system that supplies a second processing gas including a compound consisting of a N-N bond and a N-H bond to the substrate;

a fourth processing gas supply system that supplies a fourth processing gas containing hydrogen and a second element different from the first element to the substrate, the fourth processing gas being one of silane (SiH_4), disilane (Si_2H_6), trisilane (Si_3H_8), monoborane (BH_3), diborane (B_2H_6), and phosphine (PH_3);

a heating system that heats the substrate; and

a controller configured to control the first processing gas supply system, the second processing gas supply system, the fourth processing gas supply system, and the heating system so as to perform:

(a) supplying the first processing gas to the substrate;

(b) supplying the second processing gas to the substrate; and

(c) supplying the fourth processing gas to the substrate; and

(d) performing (a), (b) and (c) X times, X being a natural number, while the substrate is heated to a temperature of 250 degrees C or lower to form a first film containing the first element on the substrate.