WHAT IS CLAIMED IS:

1. A pulsed chemical vapor deposition (CVD) method for depositing a ruthenium-containing film, the pulsed CVD method comprising at least one deposition cycle,

wherein the deposition cycle comprises:

a. pulsing a zerovalent Ru precursor with a carrier gas in the absence of a co-reactant onto a surface of a substrate; and

b. delivering a purge gas to the surface of the substrate, wherein the delivering of the purge gas is for greater than or equal to 2 minutes, and

wherein during the pulsing of the zerovalent Ru precursor and the carrier gas, and during the delivering of the purge gas, a temperature of the substrate is less than or equal to a thermal decomposition temperature of the zerovalent Ru precursor.

2. The method of claim 1, wherein the zerovalent Ru precursor corresponds in structure to Formula I:

$(L)Ru(CO)_3$

(Formula I)

wherein: L is selected from the group consisting of a linear or branched C_2-C_6-alkenyl, a linear or branched C_1-C_6-alkyl, a C_3-C_6 cycloalkenyl, and a linear, branched, or cyclic dienyl-containing moiety; and wherein L is optionally substituted with one or more substituents independently selected from the group consisting of C_2-C_6-alkenyl, C_1-C_6-alkyl, alkoxy and NR^1R^2; wherein R^1 and R^2 are independently alkyl or hydrogen; or

wherein the zerovalent Ru precursor is (ethylbenzyl)(1-ethyl-1,4-cyclohexadienyl)ruthenium.

3. The method of claim 2, wherein L is a linear, branched, or cyclic dienyl-containing moiety.

4. The method of claim 2 or claim 3, wherein L is a linear, branched, or cyclic dienyl-containing moiety selected from the group consisting of butadienyl, pentadienyl, hexadienyl, cyclohexadienyl, heptadienyl and octadienyl.

5. The method of any one of claims 2 to 4, wherein the zerovalent Ru precursor is selected from the group consisting of:

(η^4-buta-1,3-diene)tricarbonylruthenium;

(η^4-2,3-dimethylbuta-1,3-diene)tricarbonylruthenium;

(η^4-2-methylbuta-1,3-diene)tricarbonylruthenium; and

(cyclohexadiene)tricarbonylruthenium.

6. The method of any one of the previous claims, wherein the pulsing the zerovalent Ru precursor is for greater than or equal to1 second.

7. The method of any one of the previous claims, wherein the pulsing the zerovalent Ru precursor is for1 second to 10 seconds.

8. The method of any one of the previous claims, wherein the pulsing the zerovalent Ru precursor is performed at a pressure of 0.1 Torr to 5 Torr.

9. The method of any one of the previous claims, wherein the delivering the purge gas is for 2 minutes to 5 minutes.

10. The method of any one of the previous claims, wherein the delivering the purge gas is for 2 minutes to 4 minutes.

11. The method of claim 1, wherein the temperature of the substrate is 150°C to250°C.

12. The method of claim 11, wherein the temperature of the substrate is 200°C to 230°C.

13. The method of any one of the previous claims, wherein the substrate comprises one or more of SiO_2, Al_2O_3, TiN, WN, and WCN.

14. The method of any one of the previous claims, wherein the zerovalent Ru precursor is preheated to a temperature of 20°C to 50°C before pulsing.

15. The method of any one of the previous claims, wherein the carrier gas and the purge gas are each independently selected from the group consisting of Ar, N_2, He, CO, and a combination thereof.

16. The method of any one of the previous claims, wherein the carrier gas is preheated to a temperature of 20°C to 100°C before pulsing.

17. The method of any one of the previous claims, wherein the ruthenium-containing film has a resistivity of 30 μΩ-cm to180 μΩ-cm.

18. The method of any one of the previous claims, wherein the ruthenium-containing film has a growth rate of 0.1 Å/cycle to 2 Å/cycle.

19. The method of any one of the previous claims, further comprising annealing the ruthenium-containing film at a temperature of 300°C to 500°C.

20. The method of claim 19, wherein the annealed ruthenium-containing film has a resistivity of 20 μΩ-cm to 60 μΩ-cm.