CLAIMS

What is claimed is:

1. A method for forming a metal-containing film via a chemical vapor deposition (CVD) process comprising:

- **a.** providing at least one substrate in a reaction vessel;
- **b.** forming at least one passivated surface by exposing at least one surface of the at least one substrate to one or more high-purity alkynes or a formulation thereof, wherein the one or more high-purity alkynes or the formulation thereof has a concentration of halogen-containing impurities of less than 100 ppm;
- **c.** forming a metal-containing film on the at least one passivated surface using one or more precursors during the deposition process.

2. A method for forming a metal-containing film via a thermal atomic layer deposition (ALD) process comprising:

- **a.** providing at least one substrate in a reaction vessel;
- **b.** forming at least one passivated surface by exposing at least one surface of the at least one substrate to one or more high-purity alkynes or a formulation thereof, wherein the one or more high-purity alkynes or the formulation thereof has a concentration of halogen-containing impurities of less than 100 ppm;
- **c.** purging the reaction vessel with a first purge gas;
- **d.** introducing into the reaction vessel one or more precursors;
- **e.** introducing into the reaction vessel a source gas;
- **f.** purging the reaction vessel with a second purge gas; and
- **g.** sequentially repeating steps c through f until a desired thickness of a metal-containing film is obtained.

3. The method of claim 1, further comprising depositing a multi-component oxide film on the at least one passivated surface, wherein the multi-component oxide film comprises an oxide of two or more elements selected from magnesium, calcium, strontium, barium, aluminum, gallium, indium, titanium, zirconium, hafnium, vanadium, niobium, tantalum, molybdenum, tungsten, tellurium and antimony.

4. The method of claim 2, further comprising depositing a multi-component oxide film on the at least one passivated surface, wherein the multi-component oxide film comprises an oxide of two or more elements selected from magnesium, calcium, strontium, barium, aluminum, gallium, indium, titanium, zirconium, hafnium, vanadium, niobium, tantalum, molybdenum, tungsten, tellurium and antimony.

5. The method of claim 1, wherein the one or more high-purity alkynes or the formulation thereof has a concentration of halogen-containing impurities of less than 50 ppm.

6. The method of claim 2, wherein the one or more high-purity alkynes or the formulation thereof has a concentration of halogen-containing impurities of less than 50 ppm.

7. The method of claim 1, wherein the one or more high-purity alkynes or the formulation thereof has a concentration of halogen-containing impurities of less than 10 ppm.

8. The method of claim 2, wherein the one or more high-purity alkynes or the formulation thereof has a concentration of halogen-containing impurities of less than 10 ppm.

9. The method of claim 1, wherein the one or more high-purity alkynes or the formulation thereof has a concentration of water of less than 50 ppm.

10. The method of claim 2, wherein the one or more high-purity alkynes or the formulation thereof has a concentration of water of less than 50 ppm.

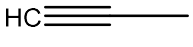
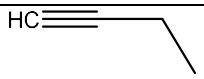
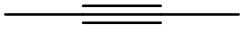
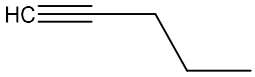
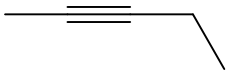
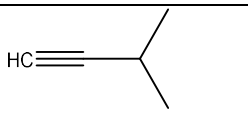
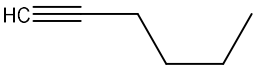
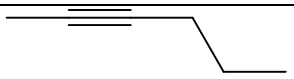
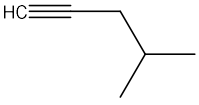
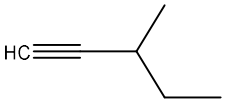
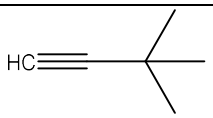
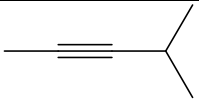
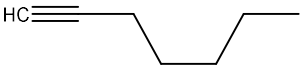
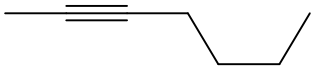
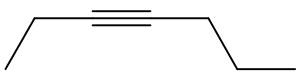
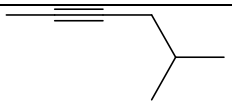
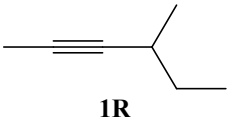
11. The method of claim 1, wherein the one or more high-purity alkynes or the formulation thereof has a concentration of carboxylic acids of less than 500 ppm.

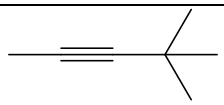
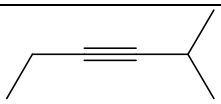
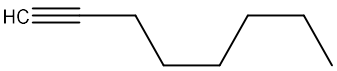
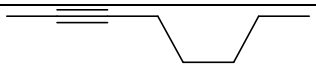
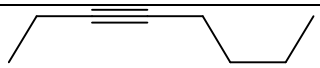
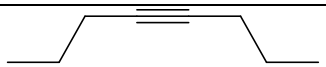
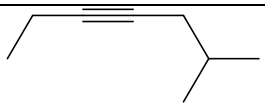
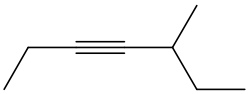
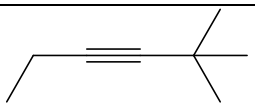
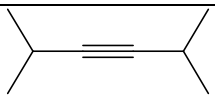
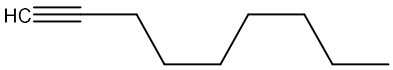
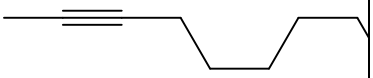
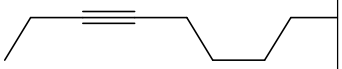
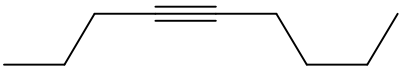
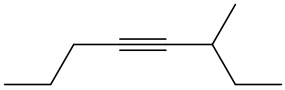
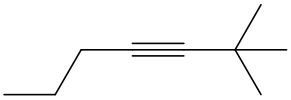
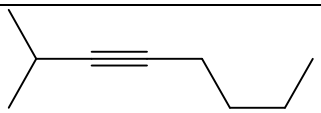
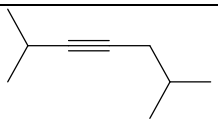
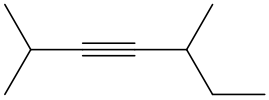
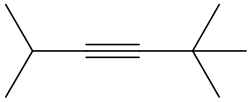
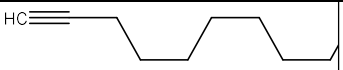
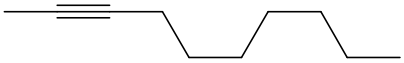
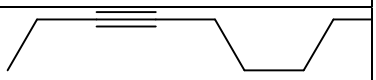
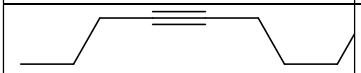
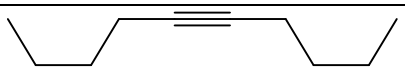
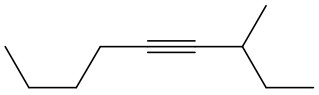
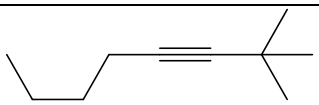
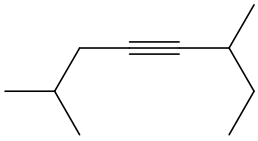
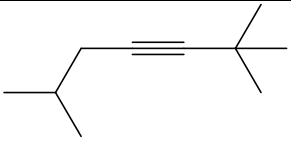
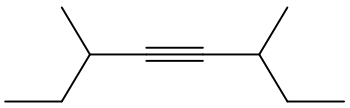
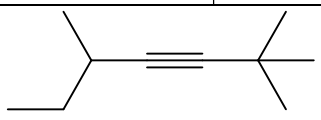
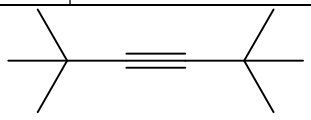
12. The method of claim 2, wherein the one or more high-purity alkynes or the formulation thereof has a concentration of carboxylic acids of less than 500 ppm.

13. The method of claim 1, wherein the one or more high-purity alkynes or the formulation thereof has a concentration of halogen-containing impurities of less than 10 ppm, a concentration of water of less than 10 ppm and a concentration of carboxylic acids of less than 100 ppm.

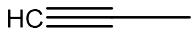
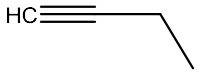
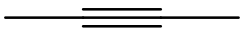
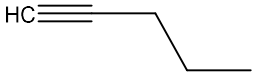
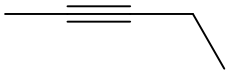
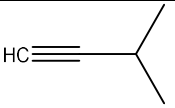
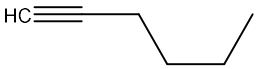
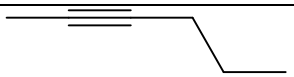
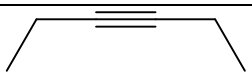
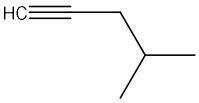
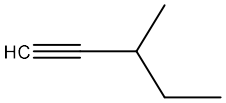
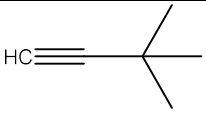
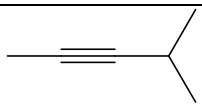
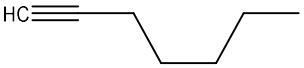
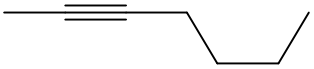
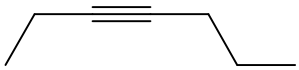
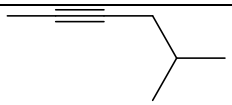
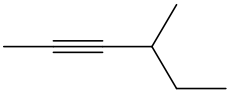
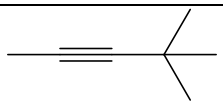
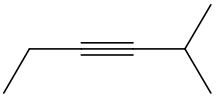
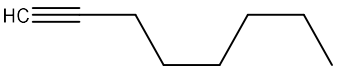
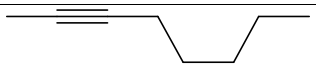
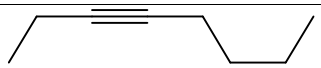
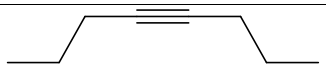
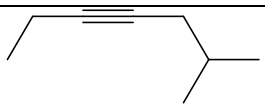
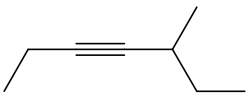
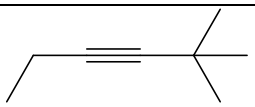
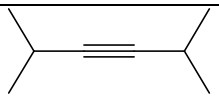
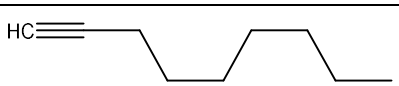
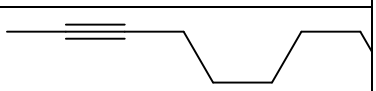
14. The method of claim 2, wherein the one or more high-purity alkynes or the formulation thereof has a concentration of halogen-containing impurities of less than 10 ppm, a concentration of water of less than 10 ppm and a concentration of carboxylic acids of less than 100 ppm.

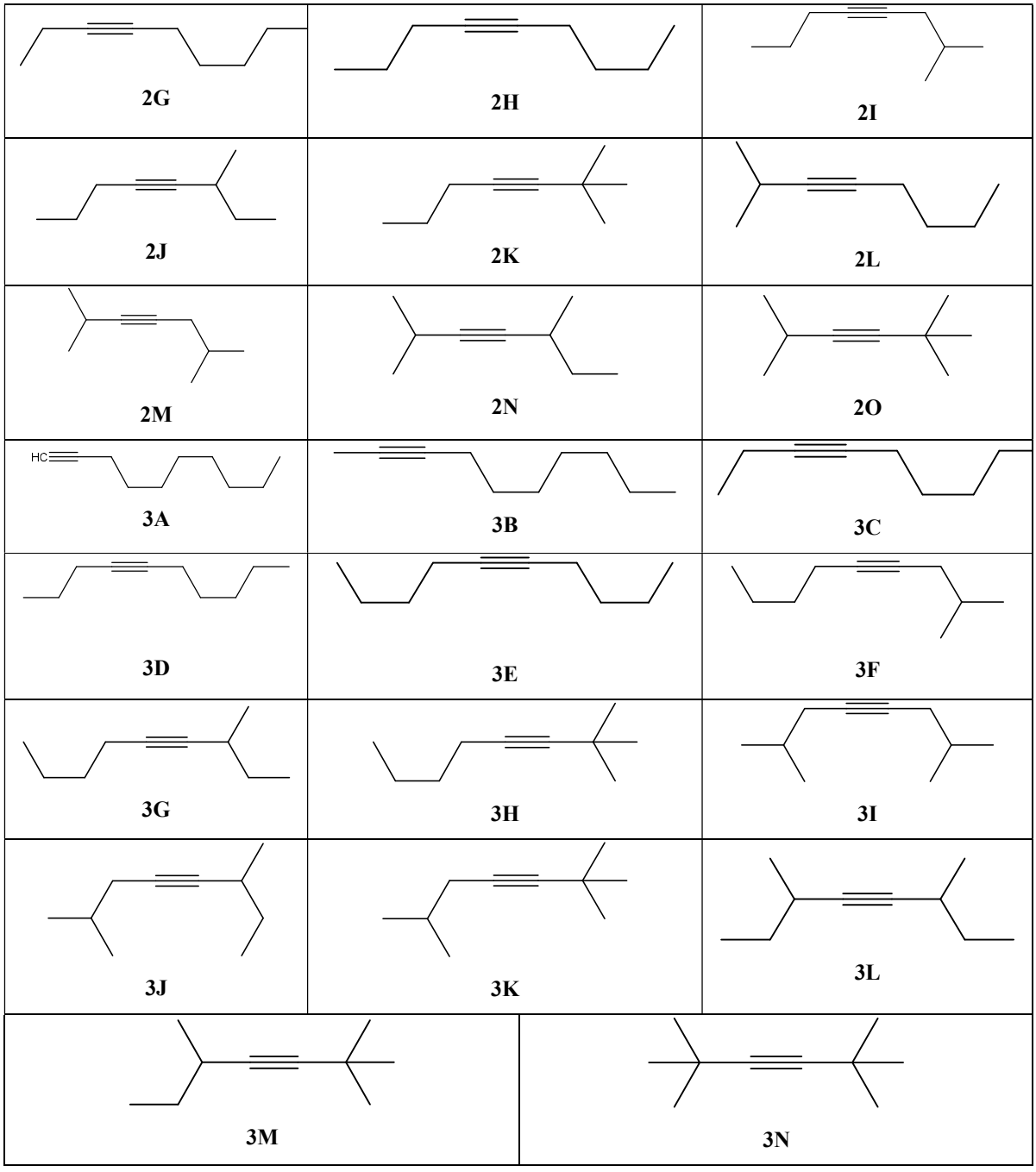
15. The method of claim 1, wherein the one or more high-purity alkynes or the formulation thereof comprises one or more of

 **1A**	 **1B**	 **1C**
 **1D**	 **1E**	 **1F**
 **1G**	 **1H**	 **1I**
 **1J**	 **1K**	 **1L**
 **1M**	 **1N**	 **1O**
 **1P**	 **1Q**	 **1R**

 1S	 1T	 1U
 1V	 1W	 1X
 2A	 2B	 2C
 2D	 2E	 2F
 2G	 2H	 2I
 2J	 2K	 2L
 2M	 2N	 2O
 3A	 3B	 3C
 3D	 3E	 3F
 3G	 3H	 3I
 3J	 3K	 3L
 3M	 3N	

16. The method of claim 2, wherein the one or more high-purity alkynes or the formulation thereof comprises one or more of

 **1A**	 **1B**	 **1C**
 **1D**	 **1E**	 **1F**
 **1G**	 **1H**	 **1I**
 **1J**	 **1K**	 **1L**
 **1M**	 **1N**	 **1O**
 **1P**	 **1Q**	 **1R**
 **1S**	 **1T**	 **1U**
 **1V**	 **1W**	 **1X**
 **2A**	 **2B**	 **2C**
 **2D**	 **2E**	 **2F**



17. The method of claim 1, wherein the one or more high-purity alkynes or the formulation thereof comprises one or more of 5-decyne (3E), 1-decyne (3A), 4-octyne (1X), 1-octyne (1U), 3-hexyne (11) and 1-hexyne (1G).

18. The method of claim 2, wherein the one or more high-purity alkynes or the formulation thereof comprises one or more of 5-decyne (3E), 1-decyne (3A), 4-octyne (1X), 1-octyne (1U), 3-hexyne (11) and 1-hexyne (1G).