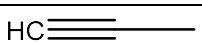
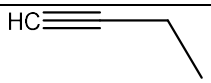
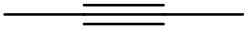
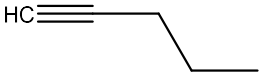
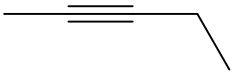
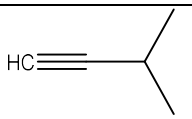
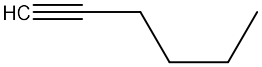
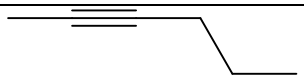
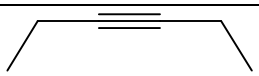
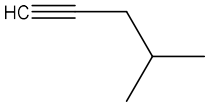
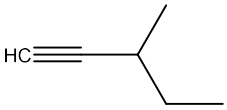
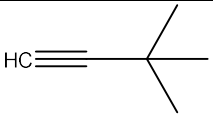
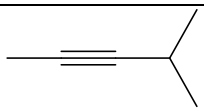
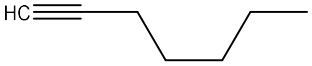
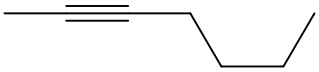
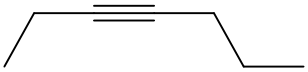
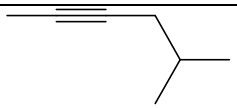
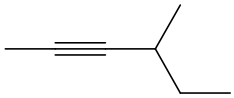
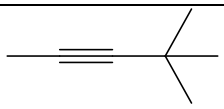
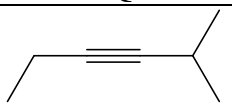
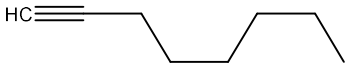
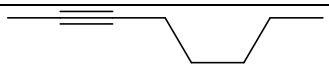
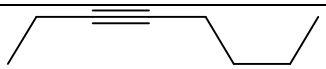
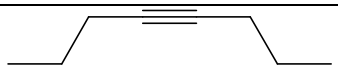
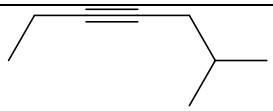
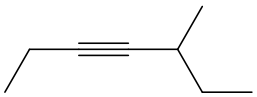
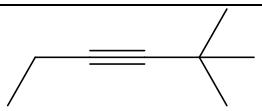
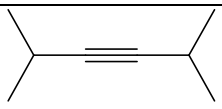
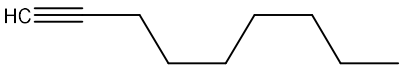
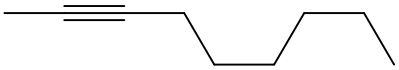
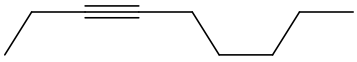
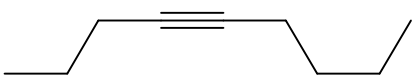
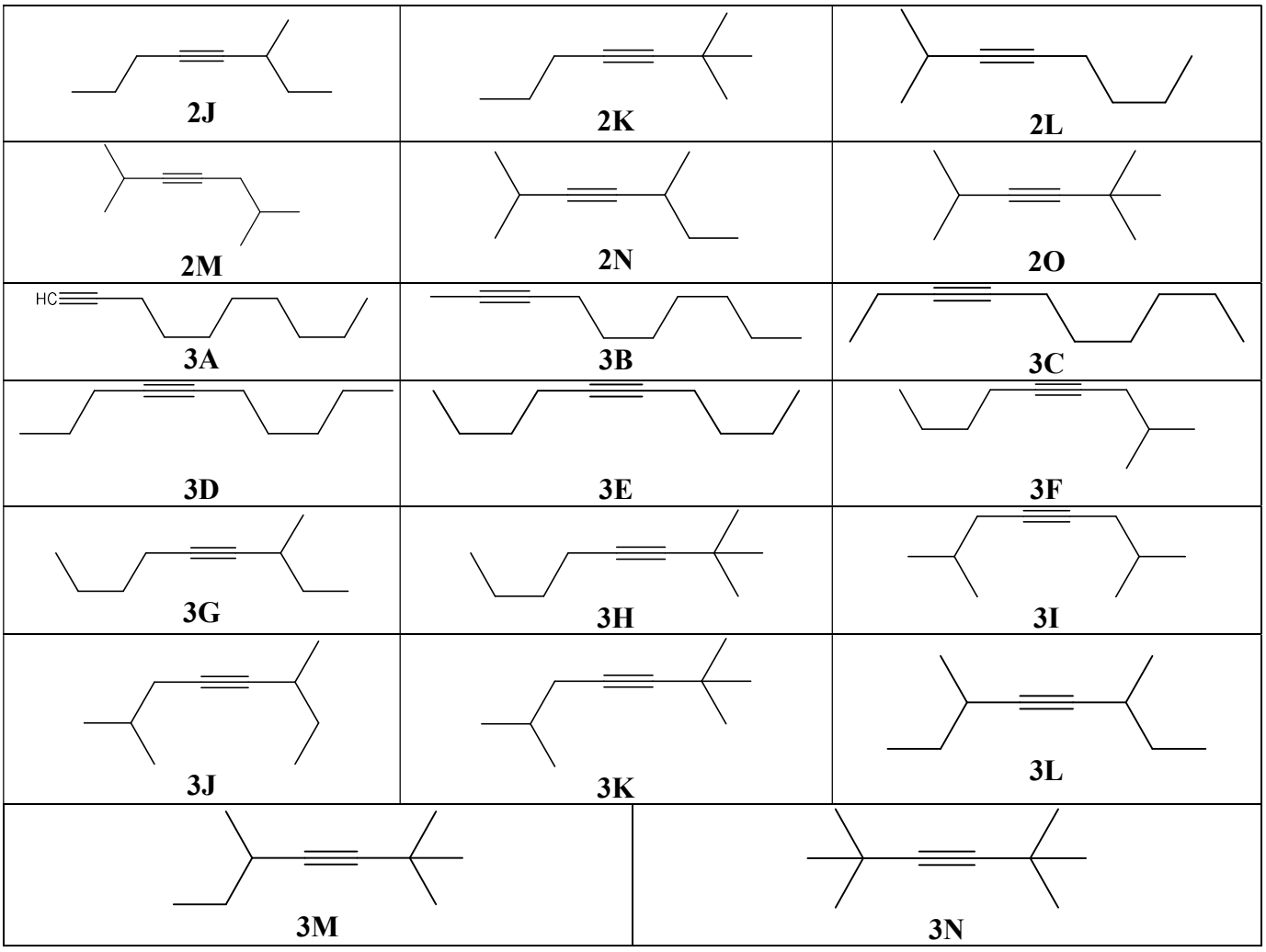
CLAIMS

What is claimed is:

1. A high-purity alkyne selected from the group 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**



wherein the high-purity alkyne has a concentration of halogen-containing impurities of less than 1000 ppm.

2. The high-purity alkyne of claim 1, wherein the high-purity alkyne has a concentration of halogen-containing impurities of less than 10 ppm.

3. The high-purity alkyne of claim 1, wherein the halogen-containing impurities are one or more of a fluorohydrocarbon, a chlorohydrocarbon, a bromohydrocarbon and an iodohydrocarbon.

4. The high-purity alkyne of claim 1, wherein the high-purity alkyne has a concentration of water of less than 500 ppm.

5. The high-purity alkyne of claim 1, wherein the high-purity alkyne has a concentration of

water of less than 10 ppm.

6. The high-purity alkyne of claim 1, wherein the high-purity alkyne has a concentration of carboxylic acids of less than 1000 ppm.

7. The high-purity alkyne of claim 1, wherein the high-purity alkyne has a concentration of carboxylic acids of less than 100 ppm.

8. The high-purity alkyne of claim 1, wherein the high-purity alkyne has a concentration of water of less than 500 ppm and a concentration of carboxylic acids of less than 1000 ppm.

9. The high-purity alkyne of claim 1, wherein the high-purity alkyne 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.

10. A surface passivating formulation comprising **(i)** one or more high-purity alkyne of claim 1.

11. The surface passivating formulation of claim 10, wherein the **(i)** one or more high-purity alkyne has a concentration of water of less than 500 ppm and a concentration of carboxylic acids of less than 1000 ppm.

12. The surface passivating formulation of claim 10, wherein the **(i)** one or more high-purity alkyne 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.

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

- **a.** providing the at least one surface of a substrate in a reaction vessel;
- **b.** forming at least one passivated surface by exposing the at least one surface to one or more of the high-purity alkynes of claim 1;

c. forming a transition metal-containing film on the at least one pre-passivated surface by a chemical vapor deposition (CVD) process using one or more precursors during the deposition process.

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

a. providing a substrate in a reaction vessel;

b. forming at least one passivated surface by exposing the at least one surface to one or more of the high-purity alkynes of claim 1;

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 the transition metal-containing film is obtained.

15. The method of claim 13, 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.

16. The method of claim 14, 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.