

## MSE-402

# FUEL, FURNACE & REFRATORY

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**Combustion, a chemical reaction between substances, usually including oxygen and usually accompanied by the generation of heat and light in the form of flame.**

Types of Combustion:

- Rapid Combustion,
- Spontaneous Combustion, and.
- Explosive Combustion.

Components of Combustion:

**Oxygen, heat, and fuel** are frequently referred to as the "fire triangle." Add in the fourth element, the chemical reaction, and you actually have a fire "tetrahedron." The important thing to remember is: take any of these four things away, and you will not have a fire or the fire will be extinguished.

**Products of Combustion**

- Carbon Dioxide.
- Carbon Monoxide.
- Sulfur Dioxide.
- Nitrogen Oxides.
- Lead.
- Particulate Matter.

Type of Combustion reaction → Redox

Combustion is a **high-temperature exothermic (heat releasing) redox (oxygen adding) chemical reaction** between a fuel and an oxidant, usually atmospheric oxygen, that produces oxidized, often gaseous products, in a mixture termed as smoke.

**Typical hydrocarbons are:**

Methane CH<sub>4</sub>

Ethane C<sub>2</sub>H<sub>6</sub>

Propane C<sub>3</sub>H<sub>8</sub>

Butane C<sub>4</sub>H<sub>10</sub>

Pentane C<sub>5</sub>H<sub>12</sub>

Hexane C<sub>6</sub>H<sub>14</sub>

Heptane C<sub>7</sub>H<sub>16</sub>

Octane C<sub>8</sub>H<sub>18</sub>

Ethene C<sub>2</sub>H<sub>4</sub>(Ethylene)

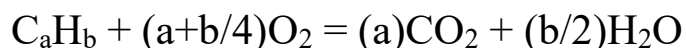
Propene C<sub>3</sub>H<sub>6</sub> (Propylene)

Ethyne C<sub>2</sub>H<sub>2</sub> (Acetylene)

Benzenol C<sub>6</sub>H<sub>6</sub> (Benzene)

Cyclohexane C<sub>6</sub>H<sub>12</sub>

**The combustion equation follows the following rule:**



\*\*\*To summarize, for combustion to occur three things must be present: **a fuel to be burned, a source of oxygen, and a source of heat.**