

Engineering Software

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P.O. Box 1180

Germantown, MD 20875

Phone/FAX: (301) 540-3605

E-Mail: info@engineering-4e.com

<http://www.engineering-4e.com>

Combustion Analysis

Here are some of the basic combustion information and plots when considering coal, oil and gas (methane) as the fuel and air as the oxidant.

Combustion Assumptions

- Fuel Temperature 298 [K]**
- Oxidant Temperature 298 [K]**
- Stoichiometric Combustion**
- No Heat Losses**

Fuel (Coal) Composition

Element	Weight [kg/kg]
C	0.78
H	0.05
S	0.03
N	0.04
O	0.08
W	0.02

Oxidant (Air) Composition

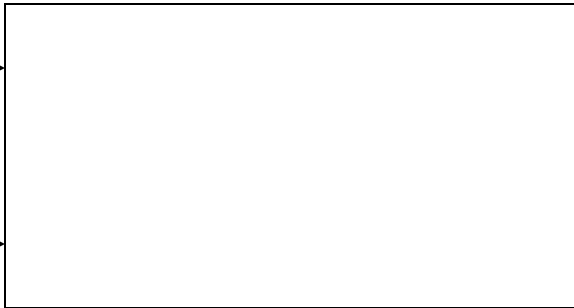
Element	Weight [kg/kg]	Mole [kmol/kmol]
N	0.767	0.790
O	0.233	0.210

Combustion Schematic Layout

Fuel -- Coal



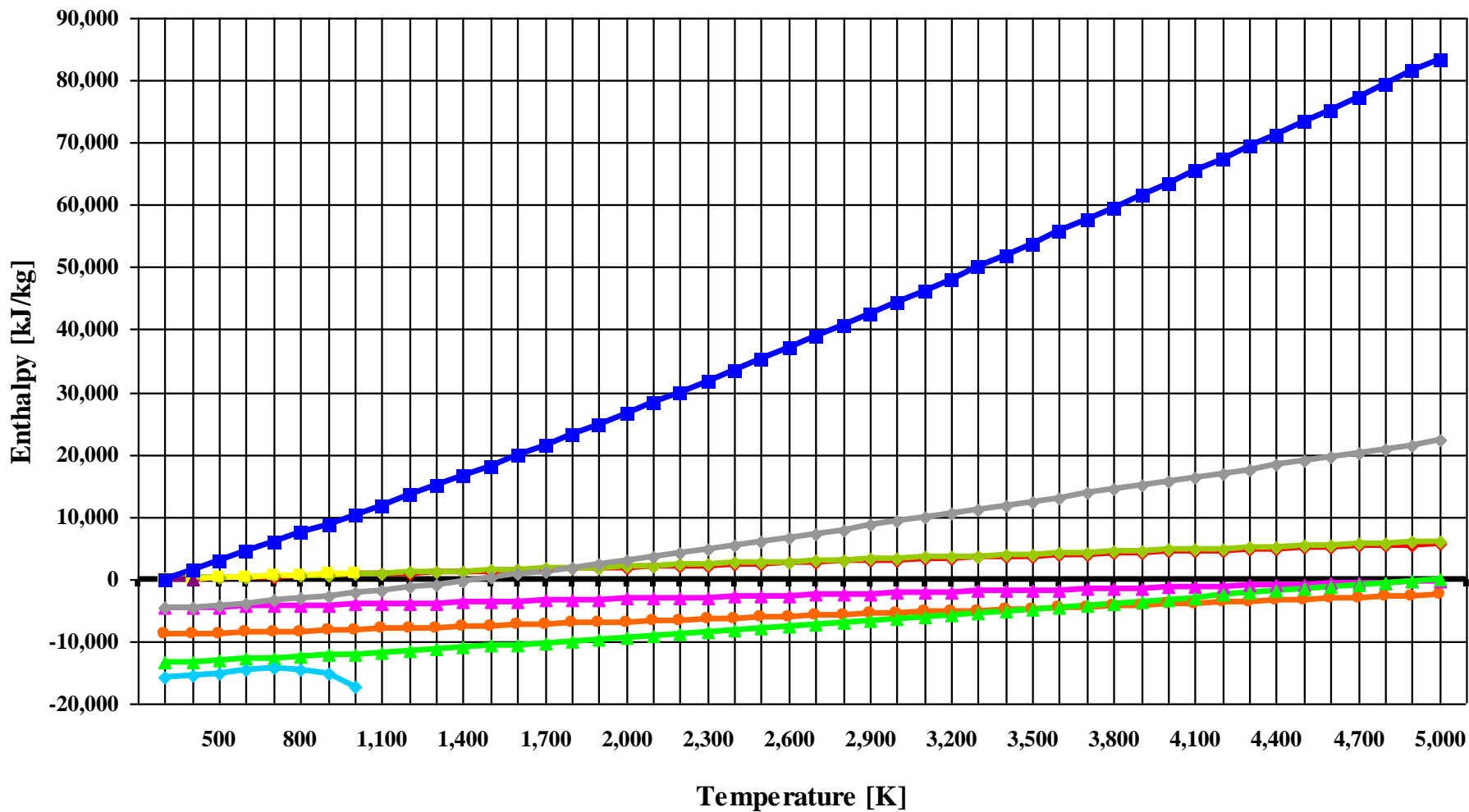
Oxidant -- Air

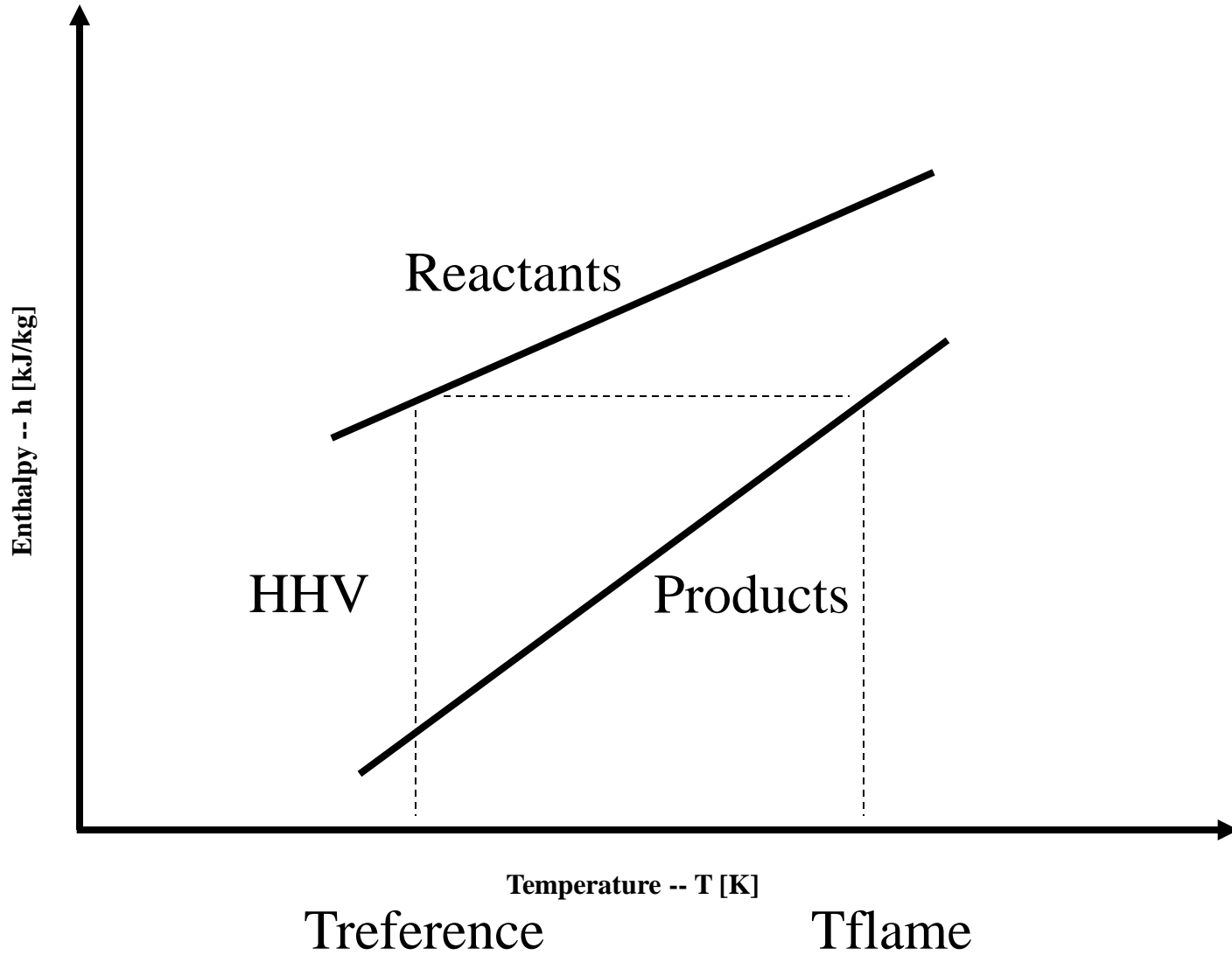


Combustion Products



Enthalpy vs Temperature





Enthalpy - Temperature $h - T$ Diagram

Combustion Products Composition

Element	Weight [kg/kg]	Mole [kmol/kmol]
CO ₂	0.249	0.170
H ₂ O	0.041	0.068
SO ₂	0.005	0.002
N ₂	0.705	0.759
O ₂	0.000	0.000

Combustion Values

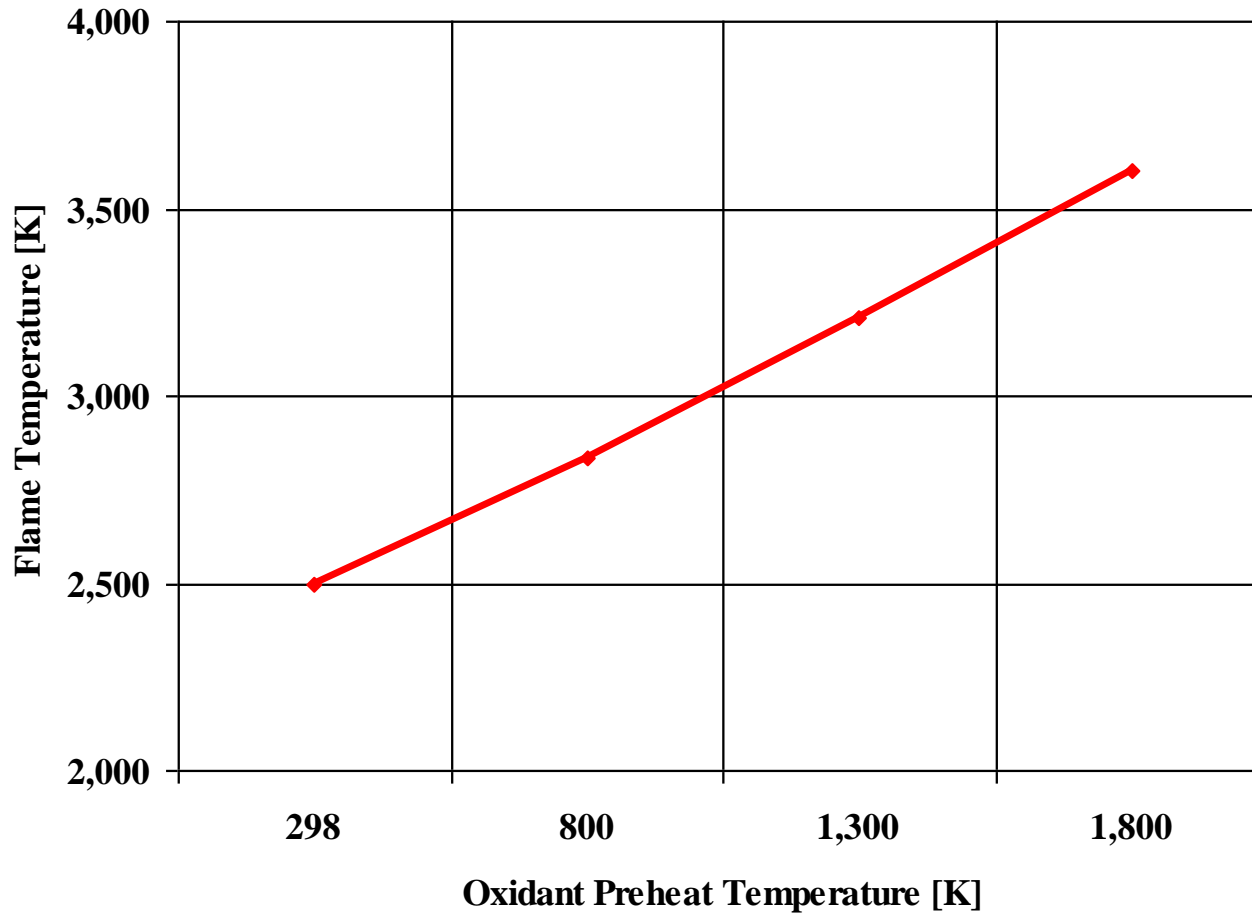
Flame Temperature

2,484 [K]

Oxidant To Fuel Ratio

10.487 [/]

Combustion Products Flame Temperature (Coal as Fuel)



—◆— Flame Temperature

Fuel Inlet Temperature: 298 [K]

Fuel (Oil) Composition

Element	Weight [kg/kg]
C	0 . 86
H	0 . 14
S	0 . 00
N	0 . 00
O	0 . 00
W	0 . 00

Oxidant (Air) Composition

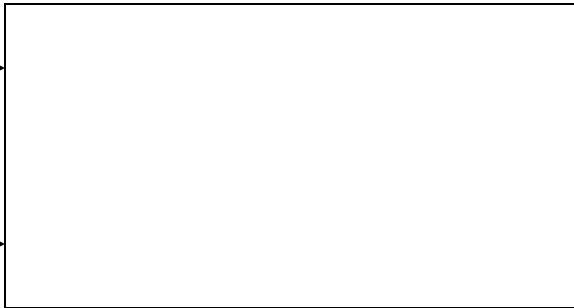
Element	Weight [kg/kg]	Mole [kmol/kmol]
N	0.767	0.790
O	0.233	0.210

Combustion Schematic Layout

Fuel -- Oil



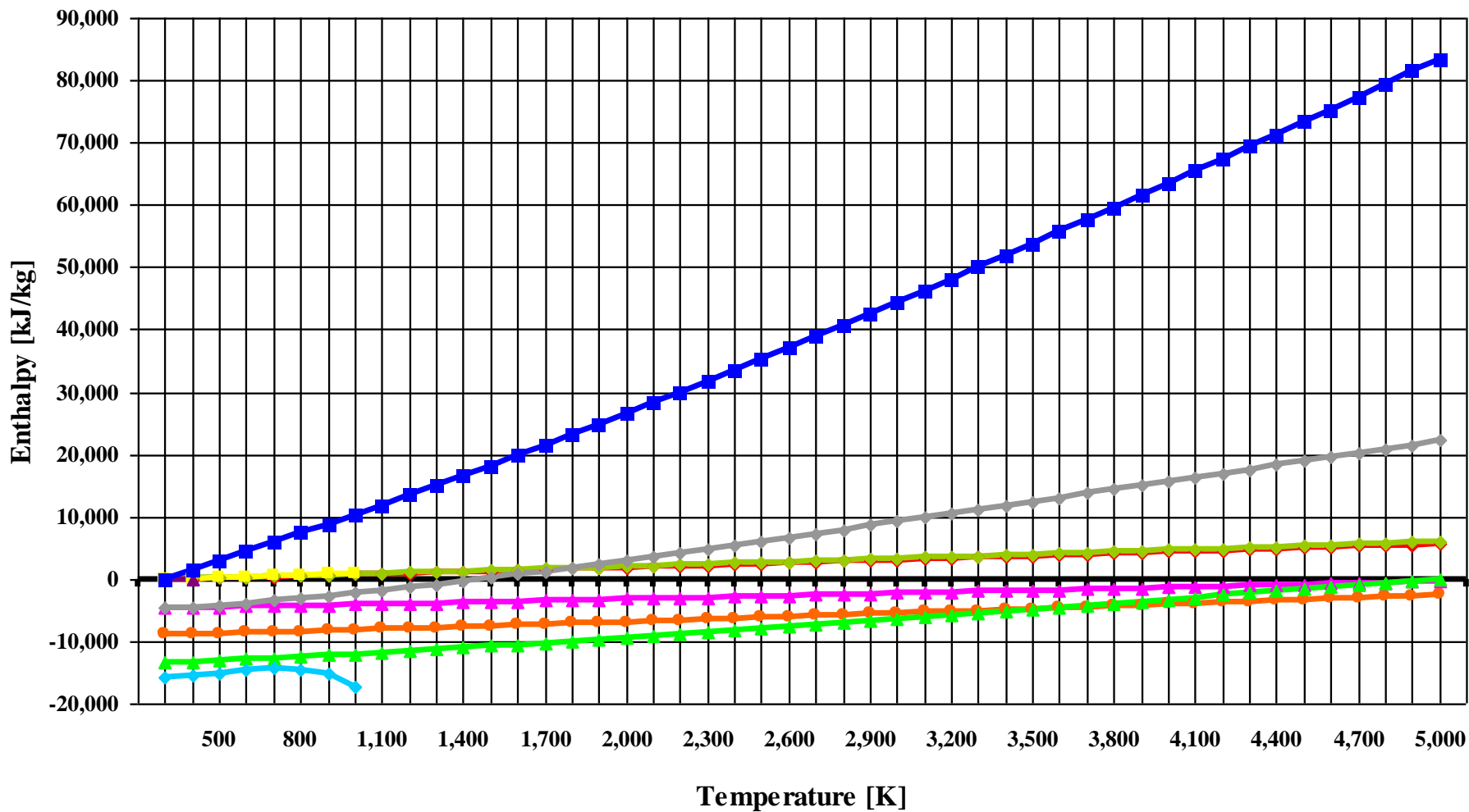
Oxidant -- Air

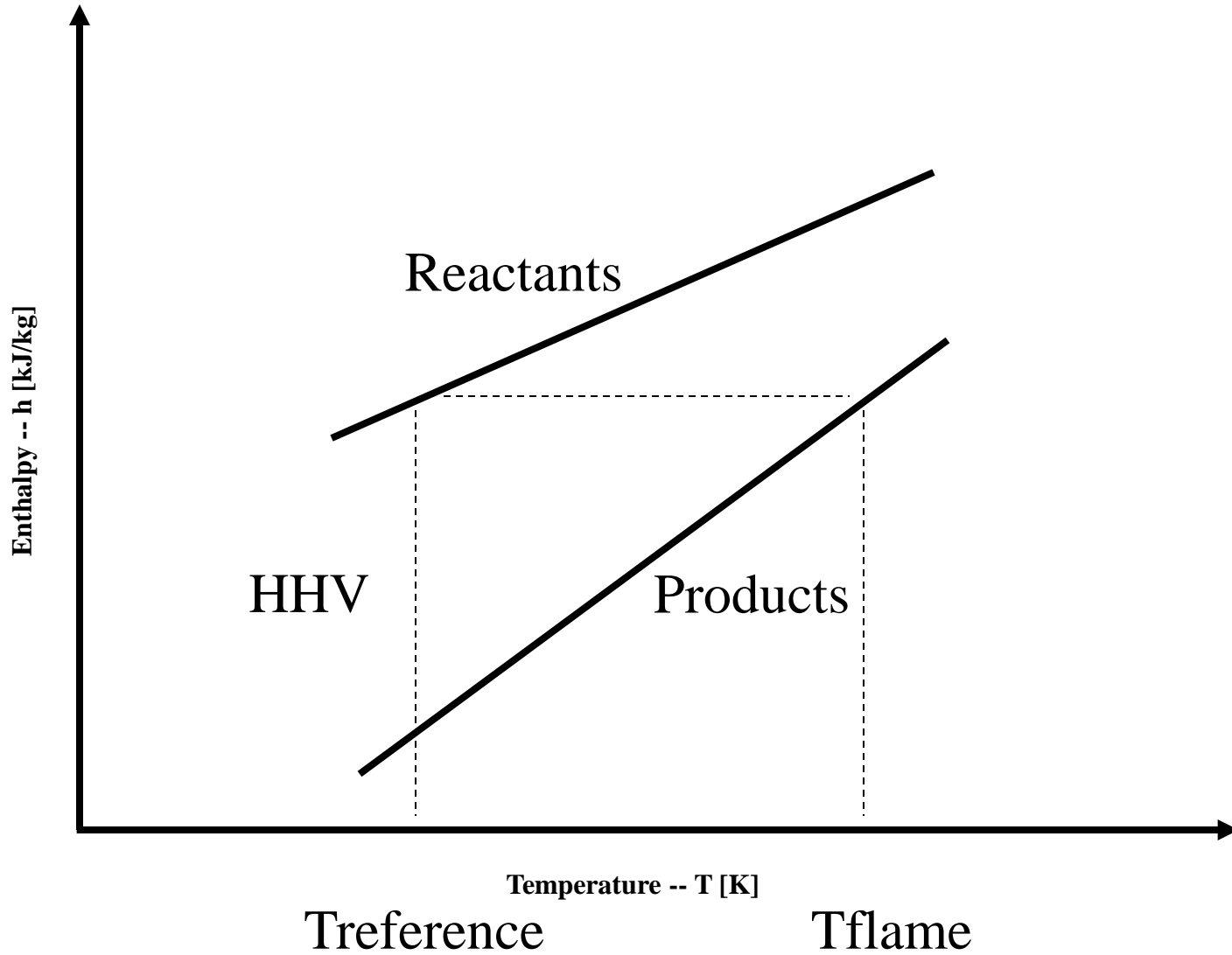


Combustion Products



Enthalpy vs Temperature





Enthalpy - Temperature $h - T$ Diagram

Combustion Products Composition

Element	Weight [kg/kg]	Mole [kmol/kmol]
CO ₂	0.202	0.132
H ₂ O	0.080	0.129
SO ₂	0.000	0.000
N ₂	0.718	0.739
O ₂	0.000	0.000

Combustion Values

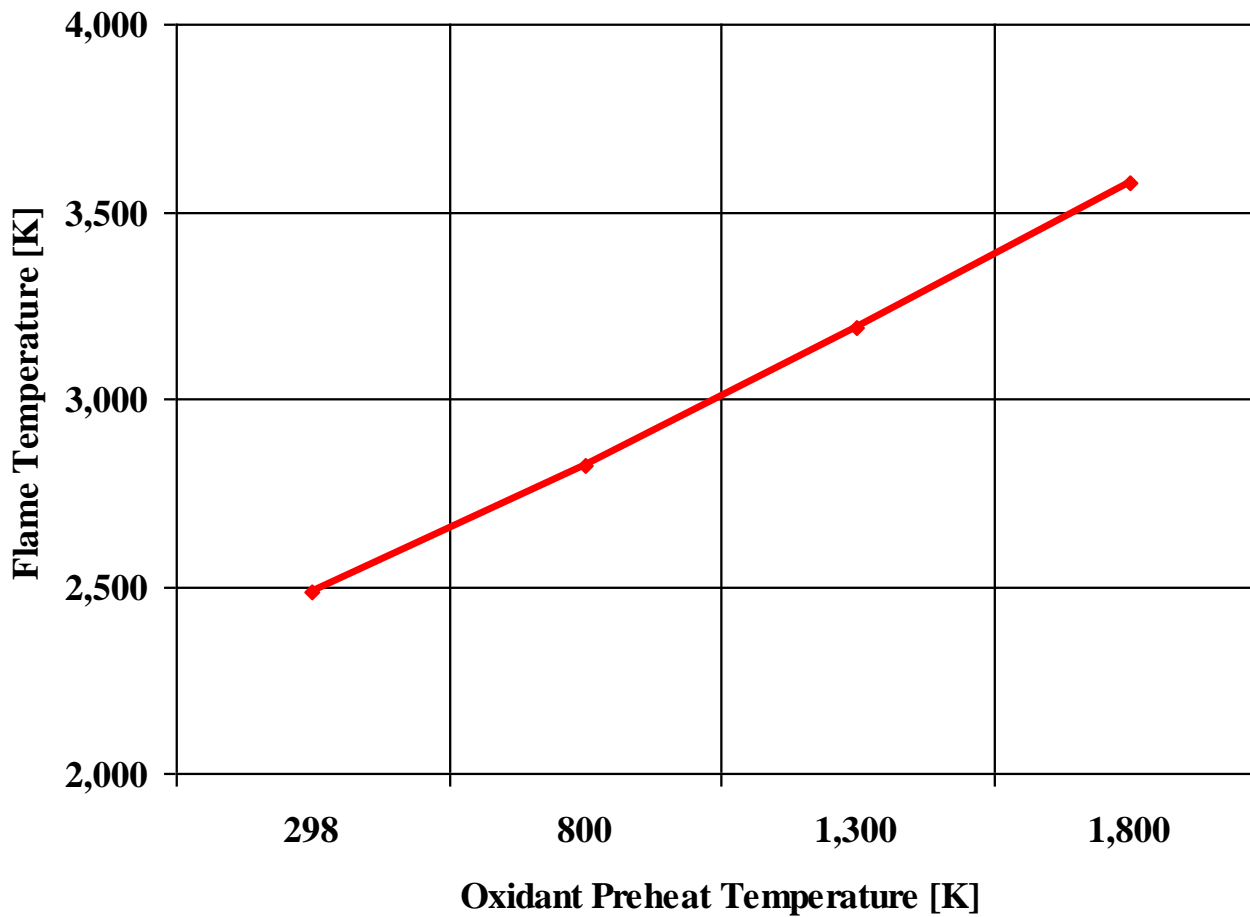
Flame Temperature

2,484 [K]

Oxidant To Fuel Ratio

14.649 [/]

Combustion Products Flame Temperature (Oil as Fuel)



—◆— Flame Temperature

Fuel Inlet Temperature: 298 [K]

Fuel (Gas -- Methane) Composition

Element	Weight [kg/kg]	Mole [kmol/kmol]
CH_4	1.00	1.00

Oxidant (Air) Composition

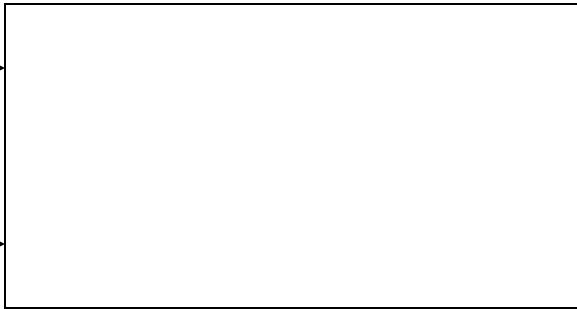
Element	Weight [kg/kg]	Mole [kmol/kmol]
N	0.767	0.790
O	0.233	0.210

Combustion Schematic Layout

Fuel -- Gas (Methane)



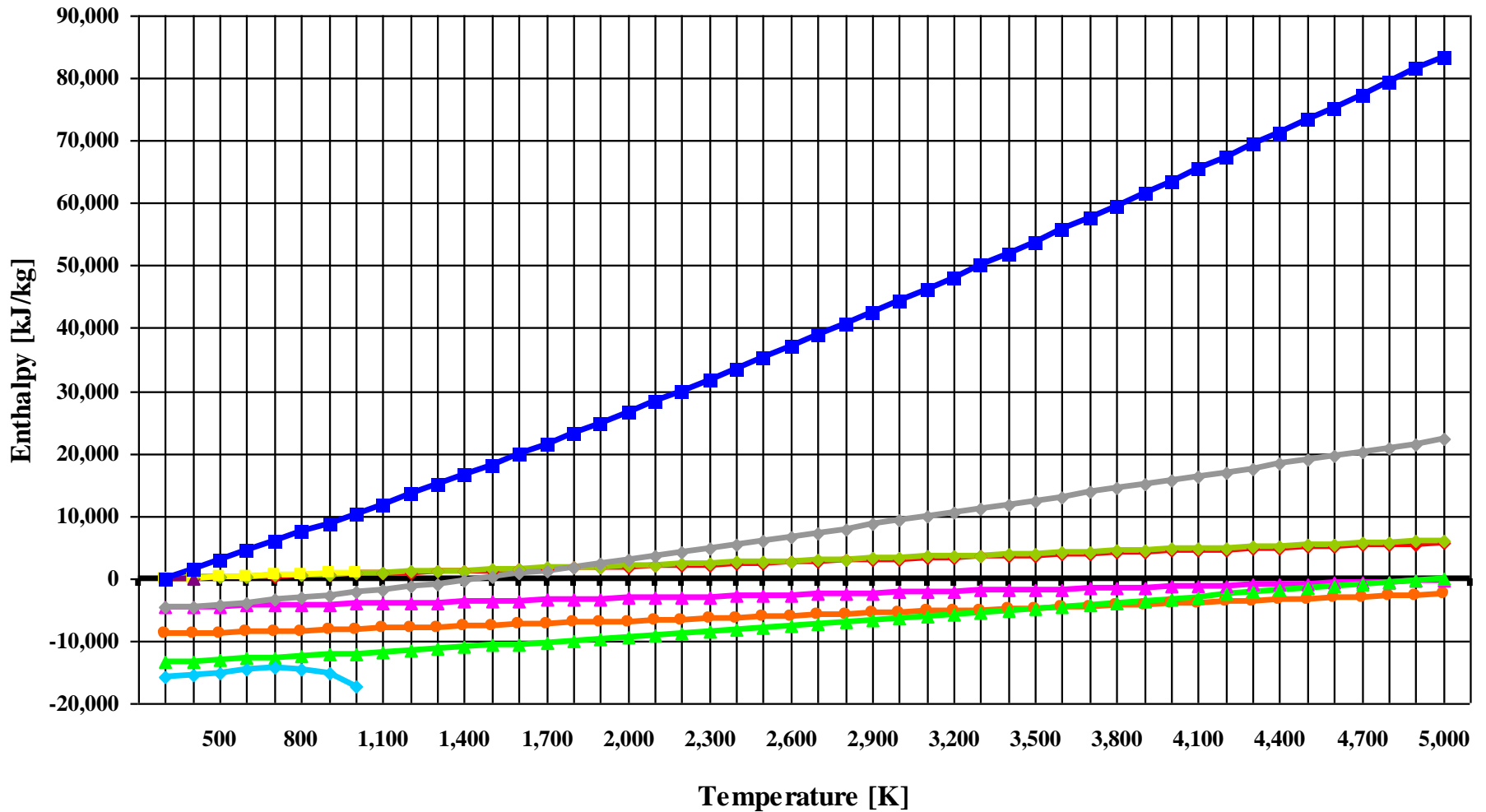
Oxidant -- Air

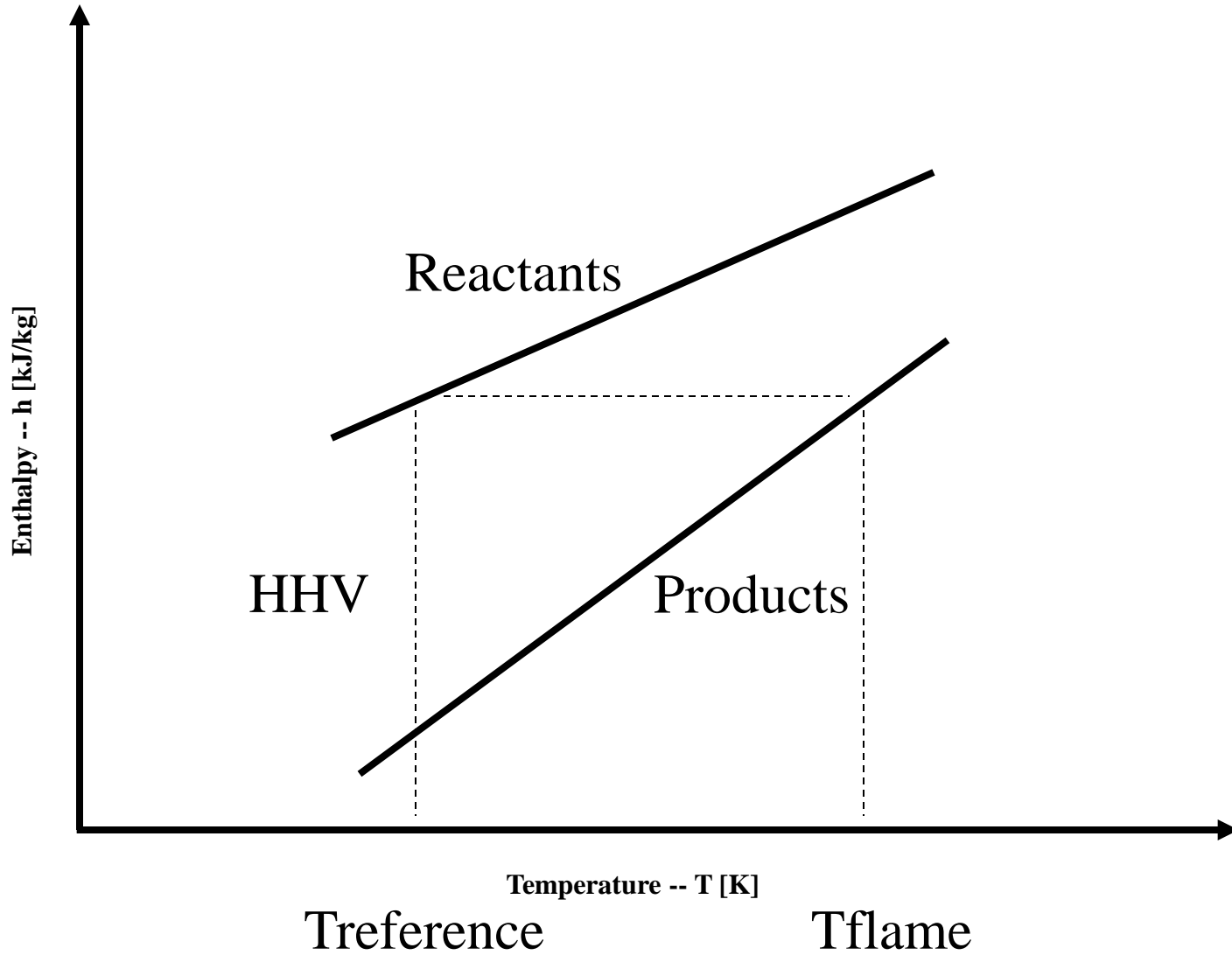


Combustion Products



Enthalpy vs Temperature





Enthalpy - Temperature $h - T$ Diagram

Combustion Products Composition

Element	Weight [kg/kg]	Mole [kmol/kmol]
CO ₂	0.151	0.095
H ₂ O	0.124	0.190
SO ₂	0.000	0.000
N ₂	0.725	0.715
O ₂	0.000	0.000

Combustion Values

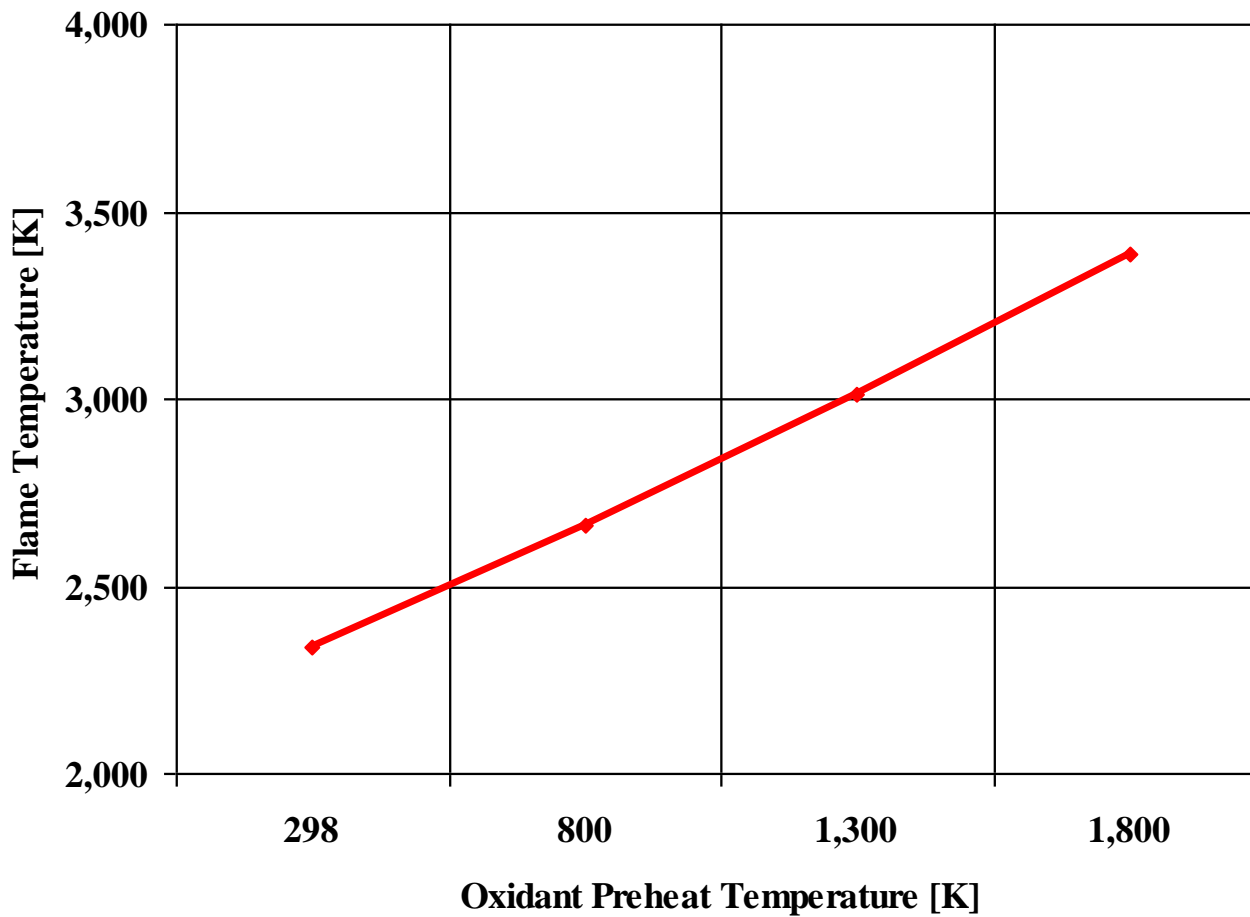
Flame Temperature

2,327 [K]

Oxidant To Fuel Ratio

17.167 [/]

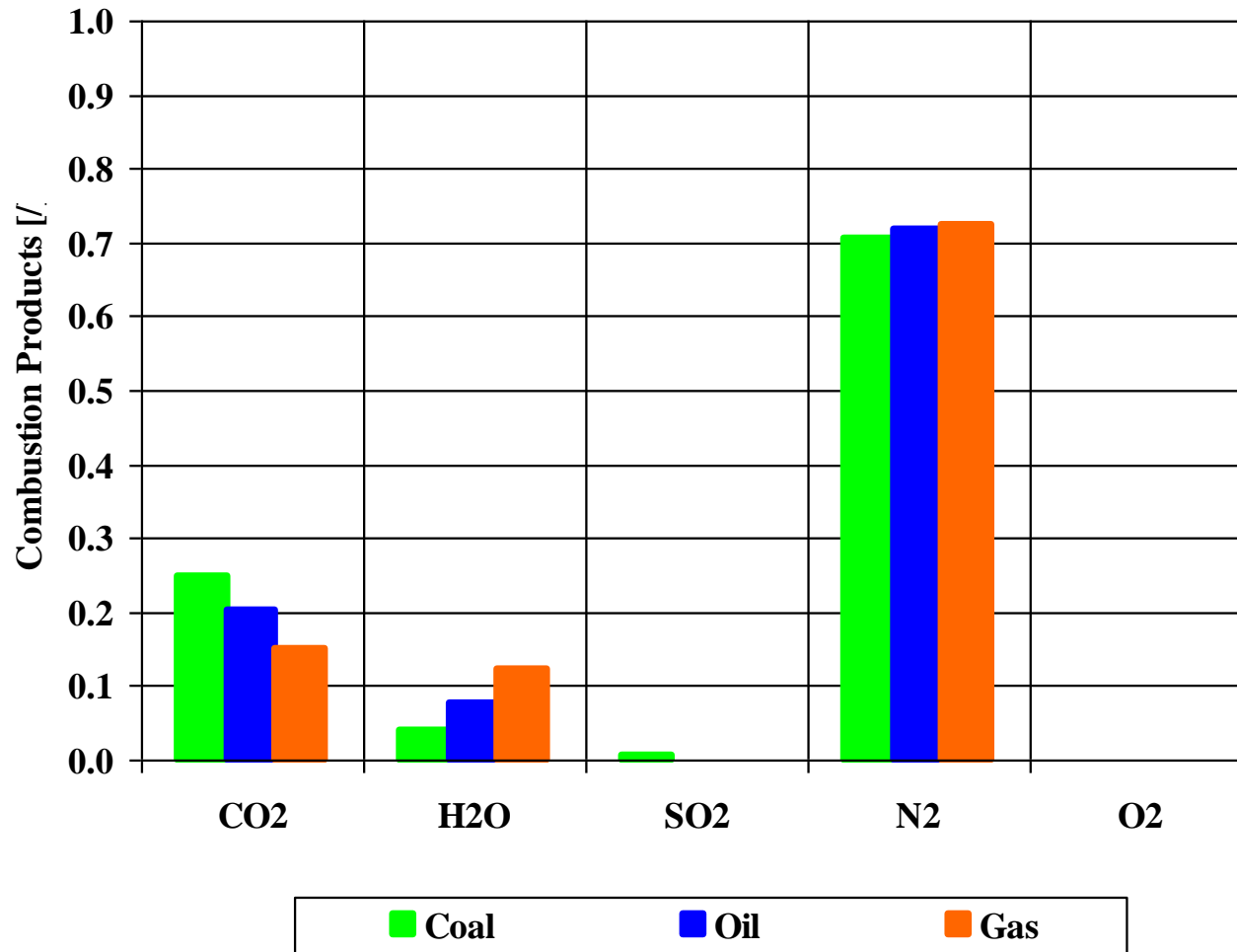
Combustion Products Flame Temperature (Gas as Fuel)



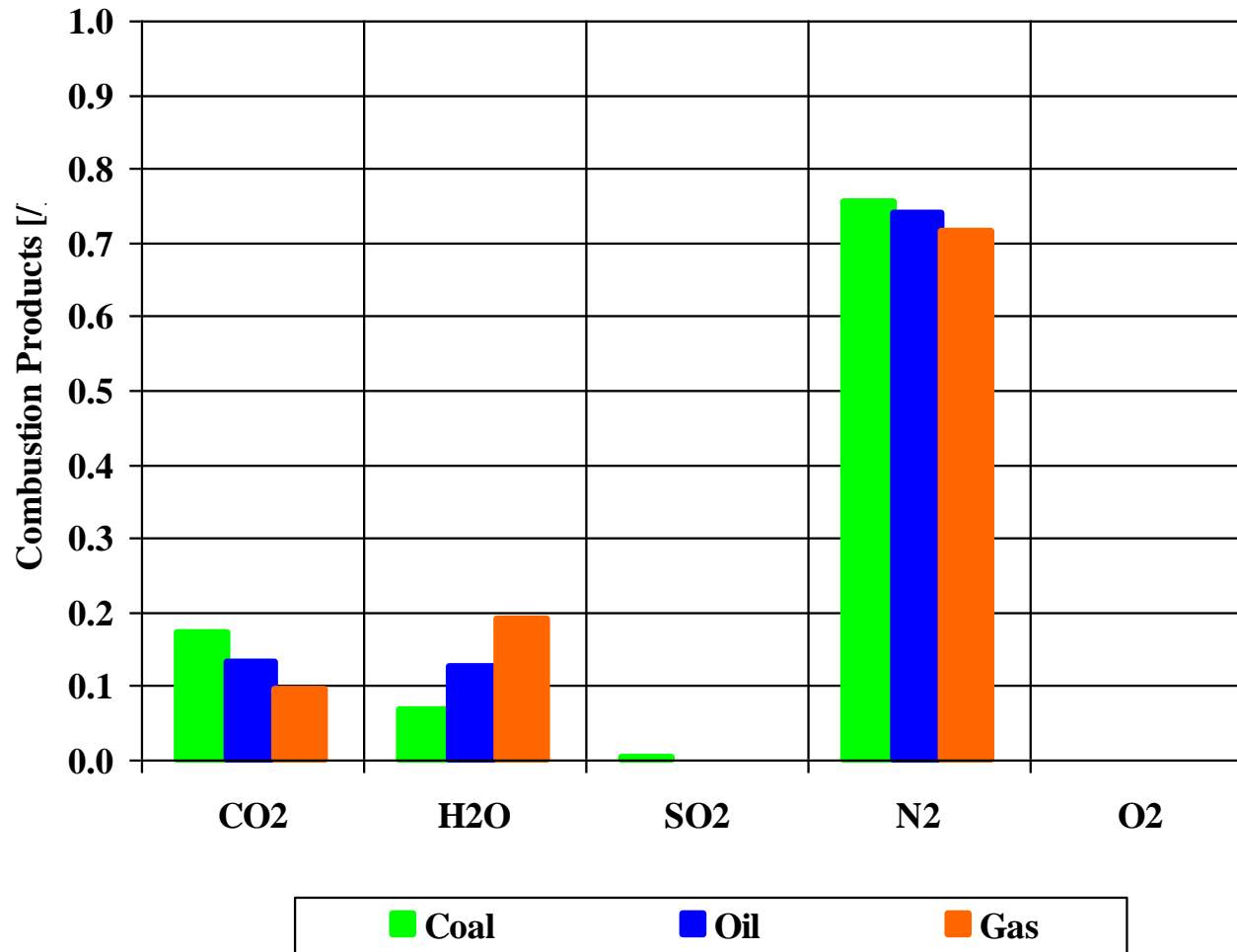
—◆— Flame Temperature

Fuel Inlet Temperature: 298 [K]

Combustion Products -- Weight Basis

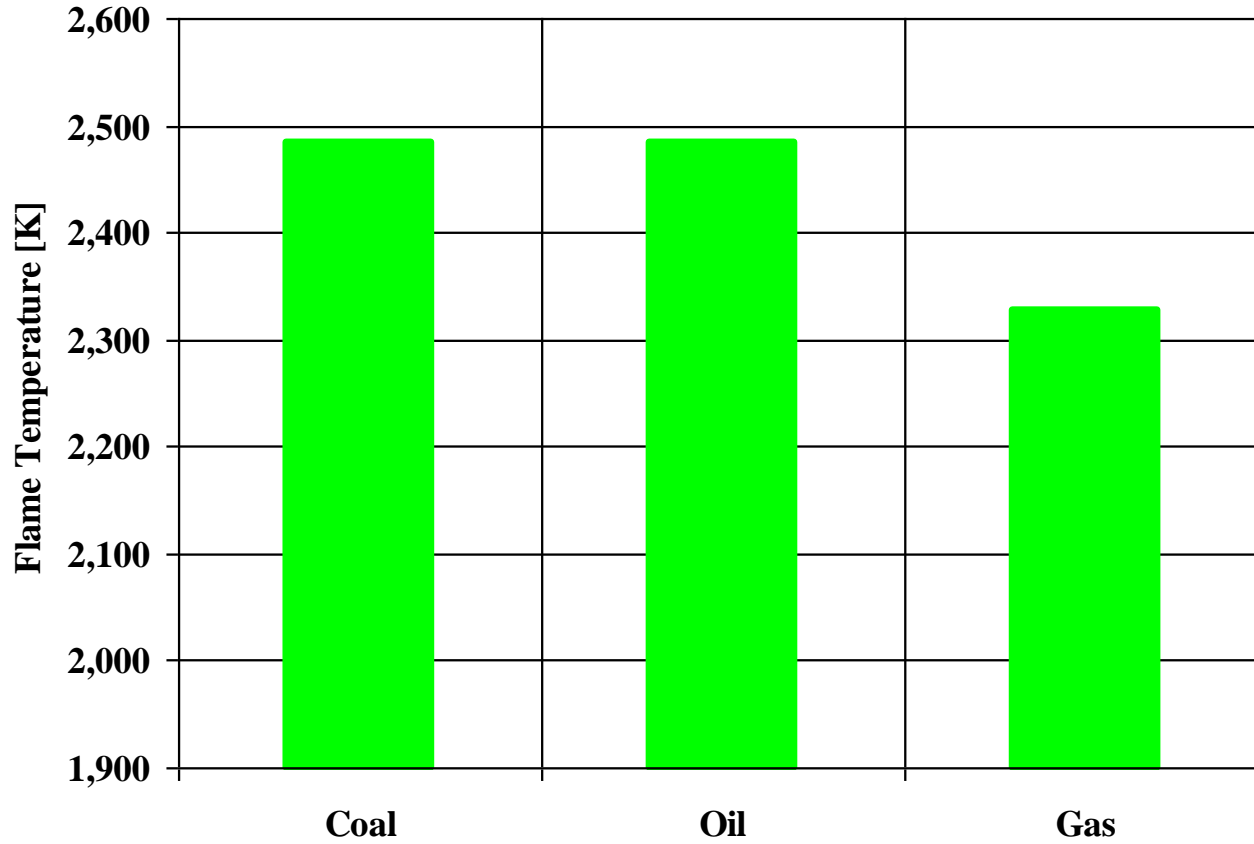


Combustion Products -- Mole Basis



Fuel and Oxidant Inlet Temperature: 298 [K]

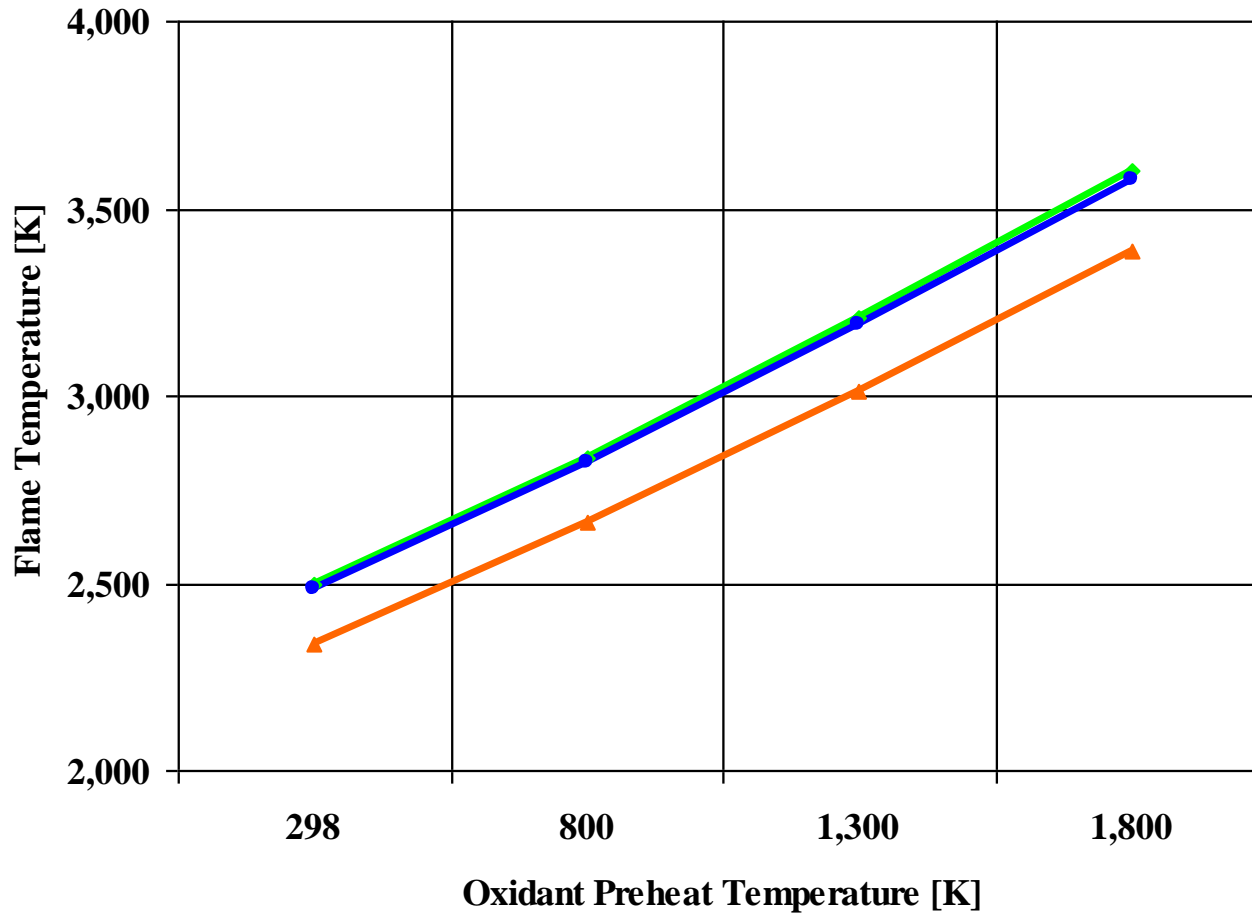
Combustion Products Flame Temperature



■ Flame Temperature

Fuel and Oxidant Inlet Temperature: 298 [K]

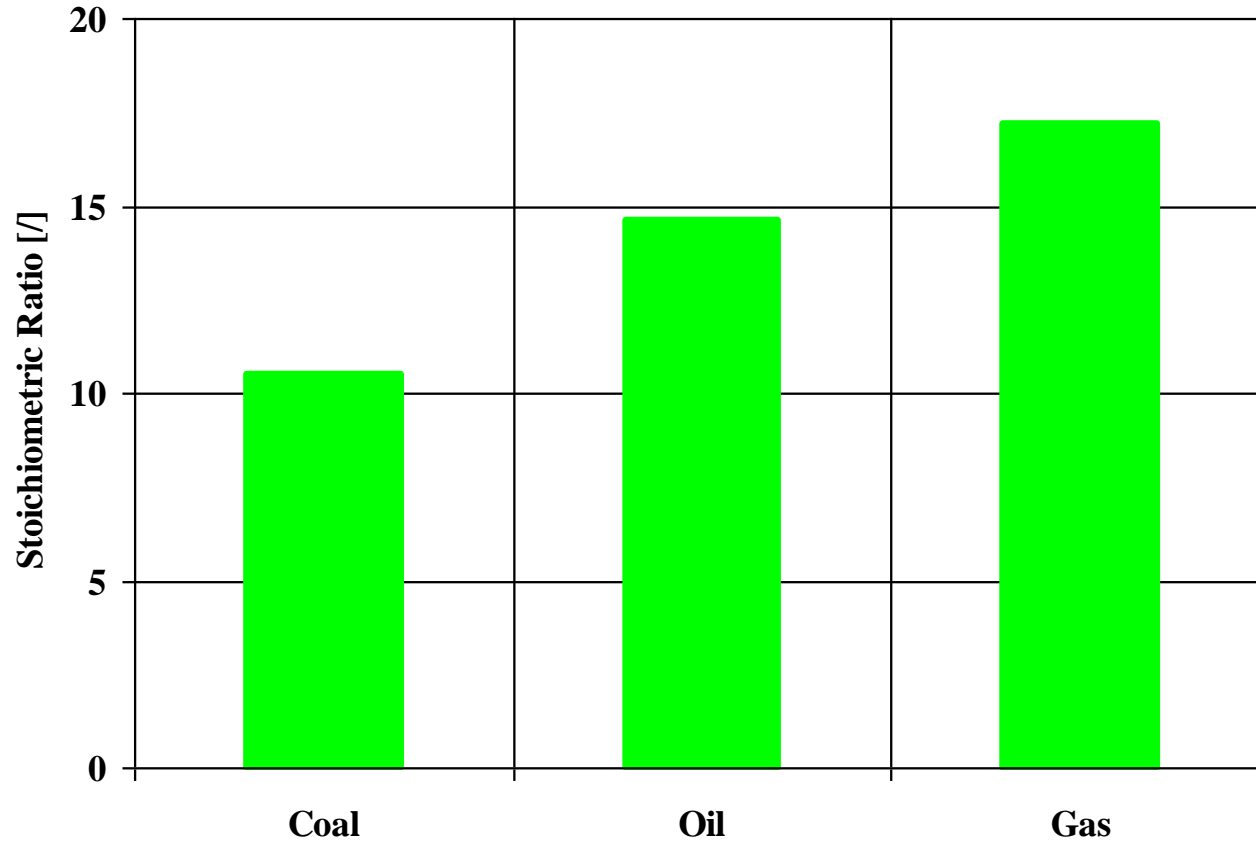
Combustion Products Flame Temperature (Coal, Oil and Gas as Fuel)



◆ Coal ● Oil ▲ Gas

Fuel Inlet Temperature: 298 [K]

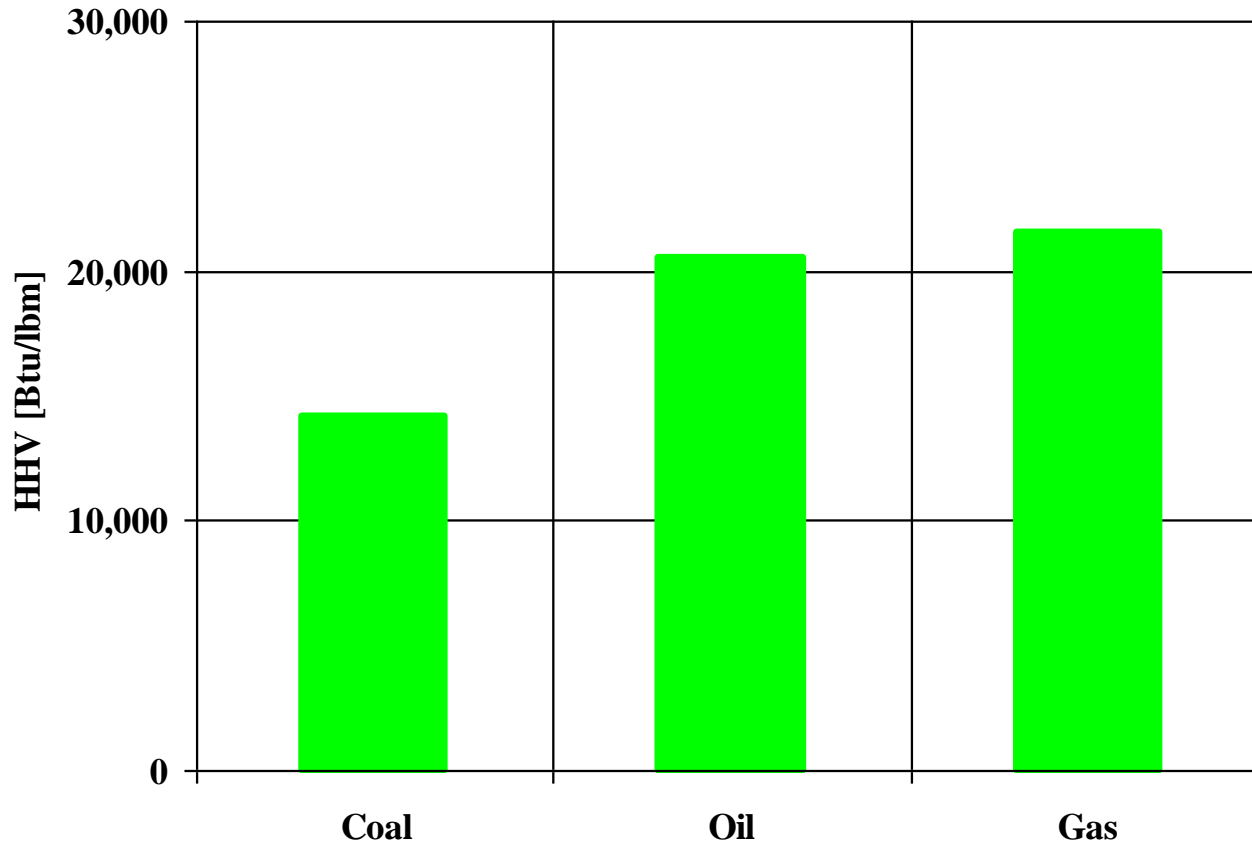
Combustion Stoichiometric Ratio



■ Stoichiometric Ratio (Oxidant to Fuel)

Fuel and Oxidant Inlet Temperature: 298 [K]

Higher Heating Value (HHV)



■ HHV

Fuel and Oxidant Inlet Temperature: 298 [K]

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