

HDPE Fire behaviour and properties

General

Standard polyethylene products like pipes and sheets, made of standard HDPE as an organic material (almost consisting of solid crystalline hydrocarbons), burns when inflamed by an outside heat source and continues burning with slow and steady blue flame and soot evolution.

As a thermoplastic material, PE is dripping with flaming drops. Depending on the vapour pressure (flame speed and ambient conditions like wind) the drops mostly stop burning during falling.

PE can completely burn off, so is not creating toxic combustion products and also the off-gases are classified non toxic.

General Classifications

UN Number / UN Hazard class	Not regulated as hazardous or dangerous goods
Hazchem code (EAC)	Not regulated as hazardous or dangerous goods
ICAO/IATA, IMO/IMDG, RID/ADR code	Not regulated as hazardous or dangerous goods
Hazardous waste Id No.	Not pertinent

Flamability Classification

DIN 4102	Grade B2
UL 94	Grade HB

Physical-chemical properties

Softening temperature	60-70°C	
Decomposition temperature	340-440°C	
Flash point	340°C	Lowest temperature to inflame the material
Auto-Ignition	380°C	Lowest temperature to start a continuous burning
Heat combustion	46,5MJ/Kg	Heat quantity released under combustion
LOI – Low Oxygen Index	17.4	Minimum O2 concentration to continue PE combustion. The value is typical for a non self-extinguishing plastic)

Off-Gases

The composition of the off-gases is similar to burned wood or stearin.

Beside minor percentage of carbon and lower-molecular additives like paraffin, olefin and cyclic hydrocarbons, major percentage of the combustion off-gases consists of carbon monoxide and carbon dioxide.

Depending on the concentration of carbon monoxide and carbon dioxide, these can be health hazardous for humans. NFPA 704 rating defines: Materials which, on exposure under fire conditions, would cause irritation but only minor residual injury even if no treatment is given.

The dilution of the off-gases can be estimated by third potency of the distance, e.g. the gas concentration in a distance of 100 m will remain just 1/1000, in distance of 1000 m will remain 1/100000.

Polyethylene off-gas analysis @ 550°C combustion conditions in (mg/g)

Carbon dioxide	1842
Carbon monoxide	312
Methane	18
Ethylene	70
Ethane	11
Propylene	38
Propane	8
1-Butene	19
Butane	6
Trans-2-Butene	11
Cis-2-Butene	2
1-Pentene	13
Pentane	3
1,3-Pentadiene	38
1-Hexene	16
2-Hexene	6

Environmental impact

Polyethylene and its combustion off-gases are not reactive with water and has no direct impact to material assets and the environment.

More details

For additional fire and explosion data, reactivity data, health hazard data and others please see our HDPE MSDS (document GI 095) and CEE Safety Data (GI 097).

Fire Retardant HDPE products

PESTEC offers advanced self-extinguishing fire retardant polyethylene pipes called FRFX 25 classified DIN 4102-1 B1, EN 13501-1 B s1 d0 and UL 94 – V0 in color black for exposed applications and different colors for indoor or buried applications.