

How to Identify Plastics

Here is a preliminary guide that will help you to identify many of the basic types of plastics using simple techniques and readily available tools. Naturally, these tests should be used only for tentative identification because some complex plastic compounds require a rigorous analysis for identification.

To initially determine whether a material is thermoset or thermoplastic, heat a stirring rod (to about 500° F) and press it against the sample. If the sample softens, the material is a thermoplastic; if not, it is probably thermosetting.

Next, hold the sample to the edge of a flame until it ignites. Hold the flame for about 10 seconds, if no flame is produced immediately. If the material burns, note the color of the flame, the nature of the smoke, the presence of the soot in the air and, if while burning, the sample drips. Next, extinguish the flame and cautiously smell the fumes. In identifying odor, a known sample is most helpful for comparison. Finally, check your observations against the known characteristics of each plastic given below. Once you have made a tentative identification, it usually is desirable to make one additional test to confirm the results of the original identification.

Materials	No Flame	Burns, but extinguishes on removal of flame source			Continues to burn after removal of flame source				Remarks
	Odor	Odor	Color of Flame	Drips	Odor	Color of flame	Drips	Speed of Burning	

Thermoplastics

ABS	-	Acrid ^e	Yellow, Blue edges ^e	No ^e	Acrid	Yellow, Blue edges	Yes	Slow	Black smoke with soot in air
Acetals	-	-	-	-	Formaldehyde	Blue, no smoke	Yes	Slow	-
Acrylics	-	-	-	-	Fruity	Blue, Yellow tip	No (cast) Yes (molded)	Slow	Flame may spurt if rubber modified

Cellulosics

Acetate	-	Vinegar ^e	Yellow with sparks ^e	No ^e	Vinegar	Yellow	Yes	Slow	Flame may spark
Acetate Butyrate	-	-	-	-	Rancid Butter	Blue, Yellow tip	Yes	Slow	Flame may spark
Ethyl Cellulose	-	-	-	-	Burnt Sugar	Yellow, Blue edges	Yes	Rapid	-
Nitrate	-	-	-	-	Camphor	White	No	Rapid	-
Propionate	-	-	-	-	Burnt Sugar	Blue, Yellow tip	Yes	Rapid	-
Chlorinated Polyether	-	-	Green, Yellow tip	No	-	-	-	-	Black smoke with soot in air

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	Odor	Odor	Color of Flame	Drips	Odor	Color of flame	Drips	Speed of Burning	

Fluorocarbons

FEP	Faint odor of burnt hair	-	-	-	-	-	-	-	Deforms; no combustion but drips
PTFE	Faint odor of burnt hair	-	-	-	-	-	-	-	Deforms; does not drip
CTFE	Faint odor of acetic acid	-	-	-	-	-	-	-	Deforms; no combustion but drips
PVF	-	-	-	-	-	-	-	-	Deforms

Nylons

Type 6	-	Burnt Wool	Blue, Yellow Tip	Yes	-	-	-	-	-
Type 6/6	-	Burnt Wool or Hair	Blue, Yellow Tip	Yes	-	-	-	-	More rigid than Type 6 Nylon
Phenoxies	-	Acrid ^e	Yellow ^e	No ^e	Acrid ^d	Yellow ^d	Yes ^d	Slow ^d	Black smoke with soot in air
Polycarbonates	-	Faint, Sweet Aromatic Ester	Orange	Yes	-	-	-	-	Black smoke with soot in air
Polyethylenes	-	-	-	-	Paraffin (wax)	Blue, Yellow Tip	Yes	Slow	Floats in water

Polyphenylene

Oxides (PPO)	-	Phenol	Yellow-Orange	No	-	-	-	-	Flame spurts; very difficult to ignite
Modified Grade	-	Phenol	Yellow-Orange	No	-	-	-	-	Flame spurts; difficult to ignite; soot in air
Polymides	^b	-	-	-	-	-	-	-	Chars; material very rigid
Polypropylene	-	Acrid ^e (burning rags)	Yellow ^e	No ^e	Sweet	Blue, Yellow Tip	Yes	Slow	Float in water; more difficult to scratch than PE
Polystyrene	-	-	-	-	Illuminating gas	Yellow	Yes	Rapid	Dense black smoke with soot in air

Polysulfones	-	-	Orange	Yes	-	-	-	-	Black smoke
Polyurethanes	-	-	-	-	^b	Yellow	No	Slow	Black smoke

Vinyls

Flexible	-	Hydrochloric Acid	Yellow with green spurts	No	-	-	-	-	Chars, melts
Rigid	-	Hydrochloric Acid	Yellow with green spurts	No	-	-	-	-	Chars, melts

Polyblends

ABS/Polycarbonate	-	-	-	-	^b	Yellow, Blue edges	No	-	Clack smoke with soot in air
ABS/PVC	-	Acrid	Yellow, Blue edges	No	-	-	-	-	Black smoke with soot in air
PVC/Acrylic	-	Fruity	Blue, Yellow tip	No	-	-	-	-	-

Thermosets

Alkyds	-	-	-	-	-	-	-	-	-
Diallyl Phthalates	-	-	-	-	Phenolic	Yellow	No	Slow	Black smoke, cracks
Diglycol Carbonate	-	-	-	-	Acrid	Yellow	No	Slow	Black smoke with soot
Epoxies	-	-	-	-	Phenol	Black smoke	No	Slow	Black smoke with soot
Malamines	Formaldehyde and fish	-	-	-	-	-	-	-	-
Phenolics	Formaldehyde and phenol	Phenol and wood or paper	Yellow	No	-	-	-	-	May crack
Polyesters	-	Hydrochloric acid	Yellow	No	^b	Yellow, blue edges	No	Slow	Cracks and breaks
Silicones	^b	-	-	-	-	-	-	-	Deforms
Ureas	Formaldehyde	-	-	-	-	-	-	-	-

^aFlame retardant grade ^bNondescript ^cInorganic filler ^dOrganic filler
Credit: Materials Engineering, Penton/IPC, Cleveland, Ohio