

TECHNICAL PAPER

Flame Retardant Compounds
EN45545-2 - LSLT - UL94 - LOI

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Clwyd Compounders has developed a range of flame-retardant compounds suitable for use in a variety of transport related applications. This includes compounds which meet the universal European Rail Standard EN 45545-2.

A range of low smoke, low toxicity (LSLT) halogen free compounds have been developed by our experienced technical team for individual applications, to ensure the material performance and processability are optimised for each application.

Achieving the balance between the level of flame resistance required and material performance is vital in ensuring the compound is not only suitable for its application but also superior in terms of processability and performance.

We recently developed a range of compounds designed specifically for approval to EN 45545-2 and presented this work at the International Rubber Conference, 2019, in London. We are pleased to announce that we are now able to offer a 70 hard EPDM approved to HL2 for R22 requirements (FR 7010).

A range of products suitable for external EN 45545-2 application testing are also available upon request.

WHAT TO ASK YOURSELF

- Do you need a compound that is flame retardant?*
- Do you need a compound that is halogen-free?*
- Do you have a standard to meet?*

We may have the compound for you, and if we don't currently, we will work alongside you to develop a tailor made compound to suit your application and industry.

NOTES

A selection of EPDM compounds we have to offer

Property	Units	FR 7009	FR 7012	FR 6509	FR 7010	FR 7004	FR 7505
Colour		Black	Black	Black	Black	White	White
Cure System		Peroxide	Peroxide	Sulphur	Sulphur	Peroxide	Peroxide
Hardness	Shore A	68	70	64	69	70	74
Temperature range	°C	-45 to 150	-45 to 150	-45 to 70	-45 to 70	-45 to 70	-30 to 150
Density	g/cm ³	1.36	1.37	1.37	1.37	1.40	1.46
Tensile Strength	MPa	9.3	12.3	9.3	9.6	3.9	4.8
Elongation at Break	%	374	337	377	356	225	304
Tear Strength	kN/m	23	28	22	26	19	26
Compression Set 22 hours @ 23°C	%	5	4	4	4	12	18
Compression Set 22 hours @ 70°C	%	-	-	14	10	-	-
Compression Set 22 hours @ 150°C	%	26	18	-	-	39	27
LOI	%	29	29	34	34	37	43
UL94	-	V0	V0	V0	V0	V1 + V2	-



Applications for a variety of industries

We also offer a range of customisable flame-retardant products for all industries which are readily available. We have developed compounds suitable for marine and aerospace applications in a variety of polymer types which can be provided upon request. If you have an application you believe could benefit from one of our many flame-retardant products, then please [contact us](#) for more information.

Silicones

We can also supply silicone compounds that contain halogen-free flame-retardant additives. The additives function by inhibiting flame propagation and improving ash cohesion, this improves the flame retardancy of the compound.

We submitted two compounds containing these additives for testing to BS EN ISO: 4589-2 (Oxygen index):

Part Number	Description	Oxygen index (%)
8856801101	FR HTV Silicone Rubber 50/55 ShoreA	31.5
8886801102	FR HTV Silicone Rubber 80/85 ShoreA	31.8



Both compounds would be classified as self-extinguishing.



Applicable test methods

Flammability testing (UL 94 Vertical)

The UL94 V test method developed by the underwriters laboratories is used to evaluate and categorise the burning behaviour of a material by subjecting it to a vertical burn.

A mounted test specimen is exposed to a controlled ignition source for 2 x 10 second intervals and the time required for the flame to self-extinguish is measured. The afterglow time and drip behaviour are also considered. The material is then assigned a V rating based on the criteria in the following table:

Test criteria	V-0	V-1	V-2
Burning time of each individual test specimen (after first and second flame applications)	≤10	≤30	≤30
Total burning time (10 flame applications)	≤50	≤250	≤250
Burning and afterglow times after second flame application	≤30	≤60	≤60
Dripping of burning specimens	no	no	yes
Combustion up to holding clamp (specimens completely burned)	no	no	no

Most of the compounds that we developed to be suitable for testing to the EN45545-2 rail standard achieved a V0 rating which is the highest rating possible for a vertical burn test.

Limiting Oxygen Index (LOI)

BS EN ISO 4589-2 (Plastics - Determination of burning behaviour by oxygen index – tested at ambient temperature)

The oxygen index is defined as the minimum concentration of oxygen, by volume percentage, in a mixture of oxygen and nitrogen that is required to just support the combustion of a material under controlled test conditions.

It's a test method that is commonly used to measure the burning performance of polymeric materials such as rubbers and plastics.

A test specimen is held vertically in a tube and burning is initiated at the upper end of the specimen by applying an ignition source. The concentration of oxygen/nitrogen in the tube is then altered until combustion is just maintained.

General classification based on LOI%	
< 20.95	Flammable
=20.95	Marginally stable
21 to 28	Slow burning
28 to 100	Self-extinguishing
>100	Intrinsically non-flammable

Clwyd Compounders are able to offer a range of different compounds which meet the Self-extinguishing classification based on LOI%

GET IN TOUCH WITH OUR TECHNICAL TEAM TO DISCUSS YOUR REQUIREMENTS FURTHER

For further information on polymer types and grades used in this paper please visit our website

www.clwydcompounders.com or call to speak to a member of our technical team +44 (0) 1978 810551.

