Fire behavior

Fire behavior

Like all organic materials, plastics are flammable. The primary and secondary fire properties for them are classified according to various norms and standards.

Primary fire properties:
- Flammability and active continued burning
- Contribution to flame spread
- Release of heat

Secondary fire properties:
- Flaming droplets / particles
- Smoke density
- Smoke toxicity
- Corrosiveness of fire gases

As the fire properties are very often tested on the end product, the design and the structure of the end product has a substantial impact on the subsequent fire properties. For example, the thickness of a cable sheath is crucial for the smoke density that is to be expected.

The respective fire scenario has a crucial bearing on the application of a particular test. If the components are subsequently to be fitted in rail vehicles, for example, tests in accordance with DIN EN 45545 are relevant. In automotive construction, the tests conducted include those according to FMVSS 302.

For numerous applications in the electrical industry, a classification of the plastics under UL (Underwriters Laboratories) 94 is indispensable. For many Elastollan® grades, corresponding tests have been conducted. Depending on the wall thickness, the Elastollan® grades with halogen-free flame retardance achieve V0, V1 or V2. Unfilled standard grades generally achieve UL-HB. As well as the fire class, further properties such as HWI, HAI, RTI and CTI have also been determined for selected Elastollan® grades. The current classifications can be viewed on the UL website under File No. E140250.

DIN EN 45545: For applications in rail vehicles, the materials are subjected, depending on the application and deployment location, to selected flame tests and then classified into what are known as “hazard levels”. Depending on the design of the components, selected Elastollan® grades achieve very good classifications, e.g. R22/R23 HL3.

FMVSS 302 (Federal Motor Vehicle Safety Standard): All Elastollan® grades meet this standard, which permits a maximum burn rate of 4 inches/min (101.6 mm/min) with a defined test setup.

DIN EN 50267-2-2 (IEC 60754): The demands of this standard with regard to the corrosiveness of the fire gases are met by all unmodified and plasticizer-containing Elastollan® grades. Additives can influence the fire behavior of Elastollan®.

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The fire properties of the individual materials can be very different in the different fire scenarios. The results cannot simply be transferred from one test to another, which makes it more difficult to make predictions when choosing materials for new applications. For instance, materials displaying very good cable fire properties do not necessarily receive a good classification according to UL94V.

One of the ways to improve the quality of such predictions is to use the cone calorimeter, which can be used to determine many material-specific properties. BASF's extensive database and many years of experience of interpreting these values allow us to offer our customers expert advice when it comes to selecting the right materials.

One example that should be cited here is the classification of the flame retardancy of selected Elastollan® grades according to Petrella (Petrella R.V., The assessment of full scale fire hazards from cone calorimeter data, J. of Fire Science, 12 (1994), p. 14), which is based on cone calorimeter measurements and allows predictions to be made for cable applications.

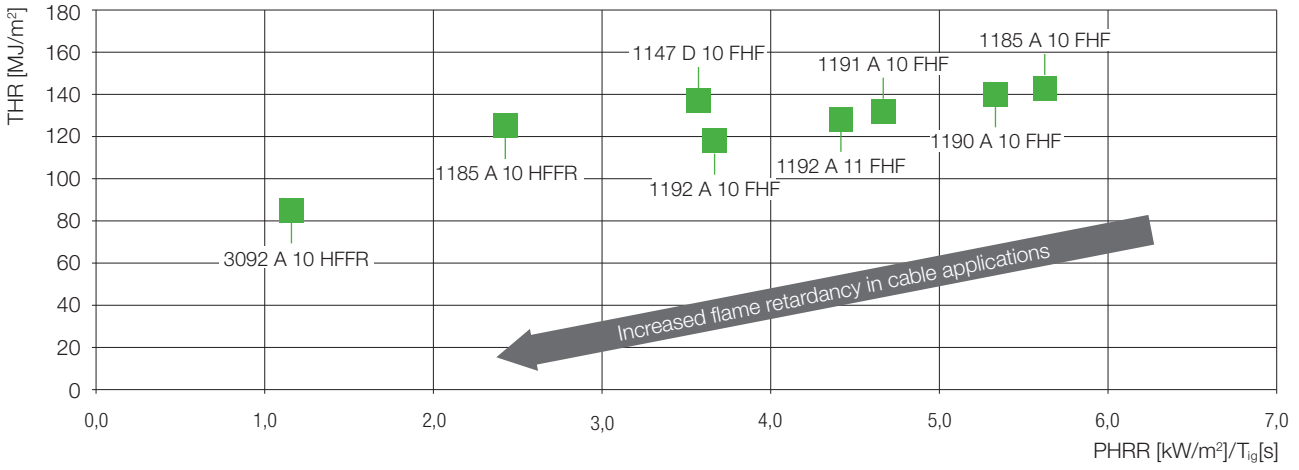

Fig. 44: Classification of flame retardancy according to Petrella; selected Elastollan® FHF and HFFR grades