Fyrolflex® BDP

Chemical Name: Bis-phenol A-bis(diphenyl phosphate)

CAS #: 5945-33-5

Overview

Fyrolflex® BDP, an oligomeric phosphate ester flame retardant, is designed for use in engineering resin applications such as polyphenylene oxide alloys and PC/ABS. Because of its low volatility and high heat stability, this phosphorus flame retardant can tolerate high processing temperature required for many engineering resins. In addition to its FR characteristics, Fyrolflex® BDP demonstrates improved processing characteristics in a number of thermoplastics including ABS and HIPS that benefit high flow in thin wall moldings and other high-performance applications.

Typically, Fyrolflex® BDP is used at 8 to 15 phr to provide flame retardancy to a variety of resins. When used as a processing aid, 1 to 3 phr of BDP is added to thermoplastics for improving melt flow characteristics with minimal loss of dimensional stability. Compared to other non-halogen FRs (phosphate esters), Fyrolflex® BDP is one of the most stable FRs with low volatility, well within the processing parameters of most engineering plastics (onset decomposition >300° C). Fyrolflex® BDP also has the advantage over other bisphosphates because of its high thermal and hydrolytic stability. This allows for a greater range of applications in thermoplastic resins. Because the phosphorus content of Fyrolflex® BDP is slightly less than other compounds, a modest increased use level must be considered for bisphenol A bis(diphenyl phosphate).
Key Applications

Typical Formulation: (FR-PC/ABS)  
Polycarbonate  
   60 – 80%  
ABS  
   10 – 30%  
Fyrolflex® BDP  
   10 – 15%  
Teflon powder  
   0.2 – 0.3%  
Stabilizers/Antioxidants  
   0.2 – 0.5%

Typical Formulation for PPO based Alloys  
Polyphenylene Oxide (PPO)  
   50 – 70%  
HIPS  
   70 – 50%  
Fyrolflex BDP  
   10 – 20%  
Stabilizers  
   ~0.5%

Processing

To compound this flame retardant into thermoplastic resins requires some unique but readily available equipment for liquid injection. Usually premixing all the components will cause agglomerations and result in irregular material feed patterns and poor dispersion in most compounding systems. One common approach is to meter the FR into the mixer by use of a positive displacement feed system (gear pump injection for example) fitted with a pressure relief valve. In a typical operation, the solid components are metered into the mixer at a known rate and homogenized into a molten state. The liquid additive is delivered at a down-stream port to a noncompression area (such as a port situated just after a vent zone of an extrusion screw). Here the free volume of this screw section allows the liquid FR to be easily pumped into the extruder and dispersed into the polymer matrix. To facilitate the material pumping, the system can be heat traced to improve the flow of product into the compounding apparatus.

Physical Data

<table>
<thead>
<tr>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>°F</td>
</tr>
<tr>
<td>°C</td>
</tr>
<tr>
<td>kg/liter</td>
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<table>
<thead>
<tr>
<th>Viscosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>°C</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>37.8</td>
</tr>
<tr>
<td>98.8</td>
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<table>
<thead>
<tr>
<th>Vapor Pressure</th>
</tr>
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<tbody>
<tr>
<td>°F</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>100</td>
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<tr>
<td>150</td>
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<tr>
<td>200</td>
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Heat Capacity

<table>
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<tr>
<th>°F</th>
<th>134</th>
<th>152</th>
<th>170</th>
<th>188</th>
<th>206</th>
<th>224</th>
<th>242</th>
<th>260</th>
<th>278</th>
<th>296</th>
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</thead>
<tbody>
<tr>
<td>°C</td>
<td>56.8</td>
<td>66.8</td>
<td>76.8</td>
<td>86.8</td>
<td>96.8</td>
<td>107</td>
<td>117</td>
<td>127</td>
<td>137</td>
<td>147</td>
</tr>
<tr>
<td>kJ/kgK</td>
<td>1.626</td>
<td>1.648</td>
<td>1.670</td>
<td>1.692</td>
<td>1.714</td>
<td>1.736</td>
<td>1.758</td>
<td>1.780</td>
<td>1.802</td>
<td>1.824</td>
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<tr>
<td>*Cp</td>
<td>0.389</td>
<td>0.394</td>
<td>0.399</td>
<td>0.404</td>
<td>0.410</td>
<td>0.415</td>
<td>0.420</td>
<td>0.425</td>
<td>0.431</td>
<td>0.436</td>
</tr>
</tbody>
</table>

*BTU/lb/°F

Typical Properties

Physical appearance
Colorless to light yellow liquid

Phosphorus content, wt. %
8.9

Specific gravity, 25°C/25°C
1.270

Density @ 25°C, lbs/gal (kg/m³)
10.59 (1254)

Viscosity @ 158°F (70°C), CPS
220

Acidity, mg KOH/g
0.12 max.

Water content, wt. %
0.10 max.

Color, APHA
<100

Pour Point
47°F (8°C)

Boiling Point
>572°F (>300°C)

Solubility (water)
Insoluble

Refractive Index (@ 20°C)
1.5870


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Safety & Handling
Consult the Material Safety Data Sheet for this product.

Shipping Information
Available in bulk tank trucks, isocontainers, 2,500 lb totes, and 560 lb drums.
For further advice and assistance, contact our representatives in your area:

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