

# Product Bulletin

supresta™  
BUILT-IN DEFENSE

Fyrol® FR-4

**Fyrol®**  
Flame Retardants

**Chemical Name:** Proprietary chlorinated phosphate ester blend

**Structural Formula:** Proprietary chlorinated phosphate ester blend

**Description:** Chlorinated phosphate ester blend flame retardant

**CAS #:** Proprietary

## Overview

Fyrol® FR-4 is a very efficient additive flame retardant recommended for use in the Automotive MVSS302 and furniture California Technical Bulletin 117 flammability tests. Foams containing Fyrol® FR-4 exhibit good compression set and IFD properties. This additive has low volatility and good processing characteristics.

## Key Applications

Fyrol® FR-4 is an additive flame retardant commercially used in flexible polyurethane foams. Its superiority is demonstrated in low scorch, excellent hydrolytic stability, low volatility, low fogging and processing characteristics, which enable its incorporation into foam formulations with little or no effect on foam processing.

## Fyrol Product Selector

|      | Key polyurethane foam application | Key characteristic   |
|------|-----------------------------------|--|
| 6    | Rigid, flexible-flame lamination  | Reactive flame retardant.  |
| 38   | Flexible                          | Low scorch.  |
| FR-2 | Flexible                          | Excellent hydrolytic stability, low volatility, low fogging, and processing characteristics.                       |
| FR-7 | Flexible                          | Good compression set, IFD and scorch properties, low volatility, low scorch, and good processing characteristics.  |
| HF-4 | Flexible                          | Halogen-free, low scorch with good compression set and IFD properties. Recommended for Cal 117 and MVSS 302 foams. |
| PCF  | Rigid, flexible-BS5852            | Excellent hydrolytic stability.  |
| PNX  | Flexible                          | Highly efficient halogen-free flame retardant.   |
| TEP  | Rigid                             | Halogen-free flame retardant, excellent viscosity reducer for high viscosity polyols.                              |

## Typical Properties

|                             |                           |      |
|-----------------------------|---------------------------|------|
| Physical appearance         | Clear, transparent liquid |      |
| Specific gravity, 20°C/20°C | 1.244                     |      |
| Density @ 20°C, lbs/gal     | 10.37                     |      |
|                             | kg/m <sup>3</sup>         | 1244 |
| Viscosity @ 25°C, mPa.s     | 140                       |      |
| Acidity, mg KOH/g           | 0.10                      |      |
| Water content, wt. %        | 0.10                      |      |
| Color, APHA                 | 100                       |      |

### Levels of FR needed in a typical formulation to meet CAL 117 requirements

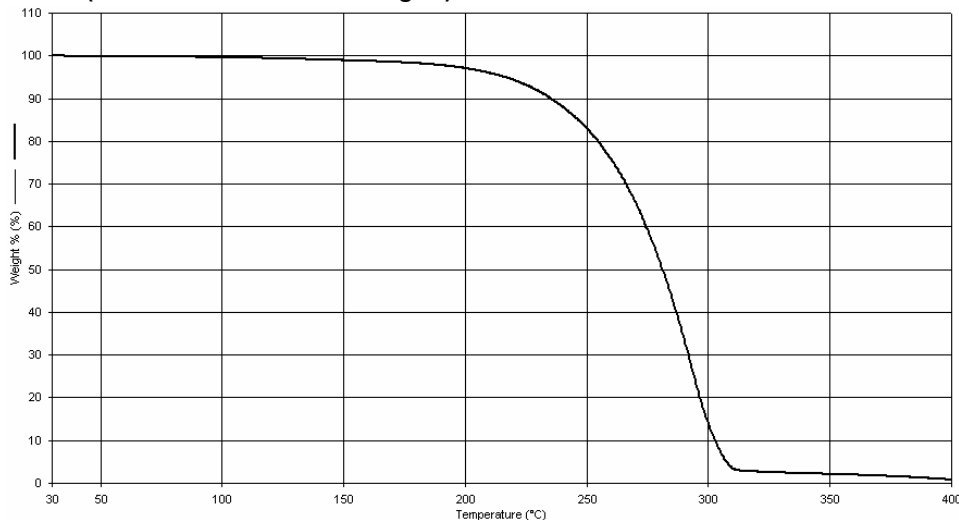
| FR          | 1.0 pcf | 1.5 pcf | 1.8 pcf |
|-------------|---------|---------|---------|
| Fyrol® FR-4 | 16      | 12      | 10      |
| Fyrol® HF-4 | 20      | 15      | 15      |
| Fyrol® FR-2 | 16      | 15      | 12      |

### Levels of FR needed in a typical formulation to meet MVSS302 SENBR requirements

| FR          | 1.0 pcf | 1.5 pcf | 1.8 pcf |
|-------------|---------|---------|---------|
| Fyrol® FR-4 | 19      | 10      | 8       |
| Fyrol® HF-4 | 19      | 15      | 15      |
| Fyrol® FR-2 | 16      | 15      | 7       |

The term 'flame retardant' is a relative one and is not intended to indicate the hazard of materials containing flame retardants under actual fire conditions.

### Thermogravimetric Analysis: Fyrol® FR-4 (10°C rise/minute in nitrogen)



|              |       |
|--------------|-------|
| 2% wt. Loss  | 185°C |
| 5% wt. Loss  | 216°C |
| 10% wt. Loss | 235°C |

### Safety & Handling

Consult the Material Safety Data Sheet for this product.

### Shipping Information

Available in bulk tank trucks, isocontainers, 2,700 lb totes, and 520 lb drums.

For more information about our products and to place an order, please contact one of Supresta's regional sales offices.

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