

Deflamer®



# LISIDE

有机磷系无卤阻燃剂系列

HALOGEN-FREE ORGANIC PHOSPHORUS  
FLAME RETARDANT SERIES

# Deflamer®



## 我们能够提供的不仅仅是产品 ! We provide more than just a product !

### 企业简介

#### Company Introduction

江苏利思德新材料股份有限公司多年来致力于低烟、无卤环保、低添加量、高阻燃性环保磷氮系阻燃剂的研发、生产、应用和销售，为江苏省高新技术企业，并于2018年获批成立**江苏省阻燃剂工程技术研究中心**。

### 品质保障

#### Quality Guarantee

符合ISO、RoHS、REACH等标准,先进的检测设备为品质保驾护航。

### 应用服务

#### Applicational Services

配备先进的加工设备及分析仪器。对客户应用体系的加工性能进行全面评估，并对产品的阻燃性能、力学性能和电气性能等进行全面的综合测试。为客户提供可操作性的阻燃解决方案。



工厂一角  
Factory Corner



江苏省(利思德)阻燃剂工程技术研究中心  
Jiangsu Liside Flame-Retardant  
Engineering Research Center



阻燃剂应用中心部分设备展示

A part of facilities in Application Center of flame retardant

## Halogen-free organic phosphorus flame retardant for PU leather coating adhesive



### Descriptions:

White powder, fine particle size, high hydrophobicity, solvent resistance and non-migration. It is applied in oil/water based PU leather with good dispersion and compatibility.

### Specifications:

Item	Unit	Specification
Phosphorous content	% (w/w)	23.3-24.0
Bulk density	g/cm <sup>3</sup>	0.20-0.40
Moisture(K-F)	% (w/w)	≤0.50
Decomposition Temperature	°C	>300
Average Particle Size(D50)	μm	<10.0

### Applications:

1. It is specially surface-treated and added in synthetic fiber and polyurethane coating with good dispersion and compatibility.
2. LFR-8001 provides nice performance to meet the requirements of UL94-V0 and FMVSS302 standards.
3. Good properties of weather, heat and migration resistance, no water stain on finished products. Specially applied in auto interiors and seat leathers in bus, airline cabins and high speed train.
4. Good processability, no change to fluidity of resin, to be well compatible with PU glue, high hydrolysis resistance and low VOC in according finished products.

### Packaging & Storage:

Delivered in 15 kg paper bags with PE inliner. Sealed storage in a dry place at room temperature. Shelf life: 12 months.

## Halogen-free organic phosphorus flame retardant for FCCL and electronic glue



### Descriptions:

Super fine white powder, high hydrophobicity, narrow particle size distribution, high temperature resistance and non-migration, It can be well dispersed in acetone, MEK and toluene etc. organic solvent.

### Specifications:

Item	Unit	Specification
Phosphorous content	% (w/w)	23.3-24.0
Bulk density	g/cm <sup>3</sup>	0.10-0.25
Moisture(K-F)	% (w/w)	≤0.50
Decomposition Temperature	°C	>300
Average Particle Size(D95)	μm	≤10.0

### Applications:

1. Good hydrolysis resistance and dispersibility in acetone, MEK, toluene, dichloromethane and N.N-dimethylformamide etc. which well avoids the white spots on finished product.
2. Mainly applied for electrical and electronic adhesive, epoxy based pouring sealant in FCCL, CCL, FPC and EV CELL etc.
3. It can be used both individually and synergically with other halogen free flame retardant and inorganic filler to reach better flame retardancy and properties of electrical, mechanical and heat resistance. High speed stirring helps better dispersion for the flame retardants
4. It has good storage stability with premixed materials and no settlement.
5. Low moisture absorption, low dielectric loss (DK) and stable electrical properties.

### Packaging & Storage:

Delivered in 12.5 kg paper bags with PE inliner. Sealed storage in a dry place at room temperature. Shelf life: 12 months.

## Halogen-free organic phosphorus flame retardant for modifying PA6/PA66//PPA/POK



### Descriptions:

White powder, good fluidity, high hydrophobicity, high temperature resistance and non-migration. It is mainly applied in nylon (PA6, PA66 and PPA with glass fiber reinforced and unreinforced).

### Specifications:

Item	Unit	Specification
Phosphorous content	% (w/w)	23.3-24.0
Bulk density	g/cm <sup>3</sup>	0.40-0.60
Moisture(K-F)	% (w/w)	≤0.20
Decomposition Temperature	°C	>350
Average Particle Size(D50)	μm	20.0-50.0

### Applications:

1. Applied in nylon (PA6, PA66 and PPA with glass fiber reinforced and unreinforced) with excellent physical and electrical properties.
2. In glass fiber reinforced nylon, dosage of LFR-8003 at 13~16% by weight and synergy with nitrogen based flame retardant can well reach UL94-V0 (0.4mm) standard.
3. Good processability with less dust, environmentally friendly.
4. Higher thermostability and wider processing window. No color influence to polymers during process.

### Sustainability:

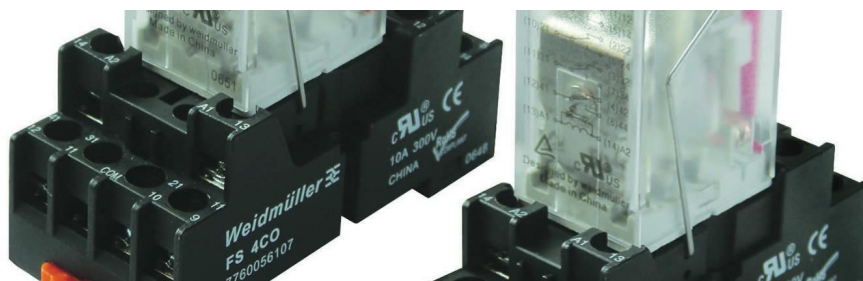
Flame retardant LFR-8003 offer outstanding sustainability advantages, supporting recycling.

### Packaging & Storage:

Delivered in 25 kg paper bags with PE inliner. Sealed storage in a dry place at room temperature. Shelf life: 12 months.



## Halogen-free organic phosphorus flame retardant for modifying PBT/PET/ PTT



### Descriptions:

White powder, high bulk density, low dust, high hydrophobicity and temperature resistance without migration. It is mainly applied in PBT, PET, PTT (glass fiber reinforced and unreinforced), and good flame retardancy synergy with nitrogen based flame retardant.

### Specifications:

Item	Unit	Specification
Phosphorous content	% (w/w)	23.3-24.0
Bulk density	g/cm <sup>3</sup>	0.40-0.60
Moisture(K-F)	% (w/w)	≤0.20
Decomposition Temperature	℃	>350
Average Particle Size(D50)	μm	40.0-80.0

### Applications:

1. Applied in PBT, PET, PTT (glass fiber reinforced and unreinforced) with high heat stability, hydrophobicity and hydrolysis resistance.
2. Excellent electrical property and thermostability, low smoke density and no color influence to the finished products, such as white, natural color etc.
3. Good processability with less dust, environmentally friendly.
4. Synergy with nitrogen based flame retardant (such as MCA and MPP) can get better balance between cost and performance.

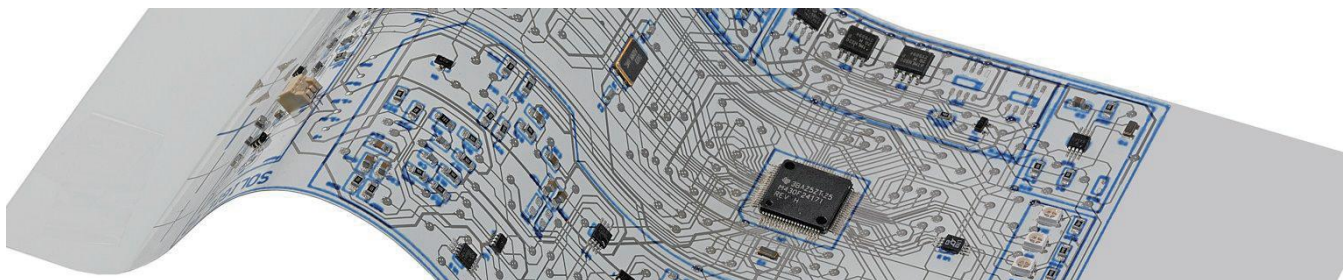
### Sustainability:

Flame retardant LFR-8004 offer outstanding sustainability advantages, supporting recycling.

### Packaging & Storage:

Delivered in 25 kg paper bags with PE inliner. Sealed storage in a dry place at room temperature. Shelf life: 12 months.

## Halogen-free organic phosphorus flame retardant for ultrathin PCB and electronic ink



### Descriptions:

White powder, super fine particle size with narrow distribution, high hydrophobicity, high temperature resistance and non-migration. It is specially processed and surface treated to ensure the use in ultrathin electronic adhesives, epoxy pouring sealant ( for ultrathin FCCL and CCL), electronic ink.

### Specifications:

Item	Unit	Specification
Phosphorous content	% (w/w)	23.3-24.0
Bulk density	g/cm <sup>3</sup>	0.10-0.25
Moisture(K-F)	% (w/w)	≤0.50
Decomposition Temperature	°C	>300
Average Particle Size(D95)	μm	≤5.0

### Applications:

- 1.Excellent hydrolysis resistance, well dispersed and compatible in acetone, butanone, toluene, dichloromethane, N, N-dimethylformamide etc.
- 2.Especially for high-end applications, such as ultrathin flexible copper clad laminate (FCCL), FFC insulating film, FFC reinforcement plate and epoxy resin copper clad laminate (CCL), which require halogen-free, excellent electrical properties and thermostability.
- 3.It can be used both individually and synergically with other halogen free flame retardants and inorganic fillers to reach better flame retardancy and properties of electrical, mechanical and heat resistance. High speed stirring helps better dispersion for the flame retardants.

### Packaging & Storage:

Delivered in 25 kg paper bags with PE inliner. Sealed storage in a dry place at room temperature. Shelf life: 12 months.

## Non-halogenated Flame Retardant for Polyester injection moulding applications



### Descriptions:

LFR-5005 is a flame retardant based on an organic aluminium phosphinate synergism with nitrogen containing compound, with high thermal stability and non-migration offering high-performance flame retardancy to polyester (PET,PBT) for both glass-fibre-reinforced and unreinforced grades.

### Specifications:

Item	Unit	Specification
Phosphorous content	% (w/w)	15.0-17.0
Bulk density	g/cm <sup>3</sup>	0.40-0.60
Moisture(K-F)	% (w/w)	≤0.30
Decomposition Temperature	°C	>320
Average Particle Size(D50)	µm	20.0-40.0

### Applications:

- 1.LFR-5005 was developed especially for the use in polyesters. It is suitable for both glass fiber reinforced and unreinforced grades.
  - 2.It is a highly stable flame retardant displaying high efficiency and high adaptability in thermoplastics polyester resins.
  - 3.Classification: Achieves UL 94 V-0 down to 0.8 mm thickness and Current Tracking Index (CTI) values of 600 Volt, Glow-wire Flammability Index (GWFI) 960 °C .
- Dosage: approx. 14-18 parts LFR-5005 / 100 parts resin
- 4.Synergistic effects are known with other flame retardants like melamine polyphosphate, melamine cyanurate to improve mechanical and electrical properties.
  - 5.LFR-5005 provides nice performance to meet the requirements of UL,VDE&CQC.

### Sustainability:

Flame retardant LFR-5005 offers outstanding sustainability advantages, supporting recycling.

### Packaging & Storage:

Delivered in 25 kg paper bags with PE inliner. Sealed storage in a dry place at room temperature.  
Shelf life: 12 months.



## Halogen-free organic phosphorus flame retardant for thermoplastic elastomer



### Descriptions:

White powder, fine particle size, high hydrophobicity, high temperature resistance and non-migration, mainly used in thermoplastic elastomer (TPE, TPU, TPEE etc).

### Specifications:

Item	Unit	Specification
Phosphorous content	% (w/w)	10.0-11.0
Bulk density	g/cm <sup>3</sup>	0.10-0.40
Moisture(K-F)	% (w/w)	≤0.50
Decomposition Temperature	°C	>300
Average Particle Size(D50)	μm	≤5.0

### Applications:

1. Good flammability with low dosage, VW-1 classification in UL1581 are reachable.
2. Good dispersibility and surface appearance in finished products.
3. High temperature resistance without PH<sub>3</sub> generated during processing.
4. Excellent aging and UV resistance in cables with different temperature levels.
5. Consistent flammability resistance without hydrolysis and migration in finished products.

### Sustainability:

Flame retardant LFR-5007 offer outstanding sustainability advantages, supporting recycling.

### Packaging & Storage:

Delivered in 15 kg paper bags with PE inliner. Sealed storage in a dry place at room temperature. Shelf life: 12 months.

## Halogen-free organic phosphorus flame retardant for modified Nylon



### Descriptions:

White powder with high hydrophobicity, high temperature resistance and non-migration, mainly used in glass-fiber-reinforced nylon (PA6 & PA66).

### Specifications:

Item	Unit	Specification
Phosphorous content	% (w/w)	20.5-21.5
Bulk density	g/cm <sup>3</sup>	0.40-0.70
Moisture(K-F)	% (w/w)	≤0.30
Decomposition Temperature	°C	>330
Average Particle Size(D50)	µm	20.0-40.0

### Product features:

- 1.Compliance with RoHS and REACH requirements.
- 2.Higher thermostability and wider processing window without color influence to polymers.
- 3.Modified nylon has better mechanical properties with LFR-5008 and the polymer has no degradation.
- 4.Modified nylon with LFR-5008 has good injection processability and finished products have nice appearance.
- 5.High hydrolysis resistance, no migration and consistent flame retardancy.

### Applications:

- 1.Applied to high-content glass fiber reinforced nylon (PA12, PA6 & PA66 etc.) with balanced flame retardancy,mechanical and electrical properties.
- 2.In PA6 or PA66 with 30% glass fiber, UL94-V0 ( 0.4mm) is reachable with dosage at 15-20%, by different polymer grades, process conditions and glass fiber content.
- 3.Moisture of polyamides < 0.1% by weight and processing temperature < 290 °C are proposed during process.
4. Flame retardant LFR-5008 offers outstanding sustainability advantages, supporting recycling.

### Sustainability:

Flame retardant LFR-5008 offer outstanding sustainability advantages, supporting recycling.

### Packaging & Storage:

Delivered in 20 kg paper bags with PE inliner. Sealed storage in a dry place at room temperature.  
Shelf life: 12 months.

## High temperature resistance Non-migration Organic Phosphorus Halogen-free Flame Retardant for PA6/PA66/PPA



### Descriptions:

LFR-5009 is phosphorous based flame retardant which is developed especially for use in polyamides. It is a white powder with high hydrophobicity, high temperature resistance and non-migration. LFR-5009 when processing at high-temperature showed higher thermal stability, it is suited for PA6/PA66/PPA, for both glass-fiber-reinforced and unreinforced grades.

### Specifications:

Item	Unit	Specification
Phosphorous content	% (w/w)	24.5-25.5
Bulk density	g/cm <sup>3</sup>	0.40-0.70
Moisture(K-F)	% (w/w)	≤0.30
Decomposition Temperature	℃	>350
Average Particle Size(D50)	μm	25.0-50.0

### Applications:

1. Compliance with RoHS and REACH requirements.
2. LFR-5009 was developed especially for use in polyamides.
3. LFR-5009 when processing at high-temperature showed higher thermal stability and superior processing stability than nitrogen-based flame retardant.
4. Low gas emission and low smoke during processing, effectively reduce corrosion of screws.
5. Suitable for applications in hot and humid environments, minimizes the risk of migration and mold deposits.

### Sustainability:

Flame retardant LFR-5009 offer outstanding sustainability advantages, supporting recycling.

### Packaging & Storage:

Delivered in 25 kg paper bags with PE inliner. Sealed storage in a dry place at room temperature. Shelf life: 12 months.

## Halogen-Free Flame Retardant for Long chain nylon (LCPA)



### Descriptions:

LFR-5012 is new additive displaying higher flame retardancy and processing stability which is especially suitable for long chain nylon (LCPA), such as PA12, PA612, PA1012, etc.

LFR-5012 is a phosphorous based flame retardant, it is a white powder with high hydrophobicity and non-migration.

### Specifications:

Item	Unit	Specification
Phosphorous content	% (w/w)	21.0-22.0
Bulk density	g/cm <sup>3</sup>	0.40-0.70
Moisture(K-F)	% (w/w)	≤0.50
Decomposition Temperature	°C	>280
Average Particle Size(D50)	μm	15.0-40.0

### Applications:

- 1.Compliance with RoHS and REACH.
- 2.Focus on providing outstanding flame retardancy for long chain nylon(PA12,PA612,PA1012) and can reach UL94 0.8mm V0.
- 3.LFR-5012provides nice performance to meet the requirements of UL,VDE&CQC.
- 4.LFR-5012 meeting RAST 2.5 and RAST 5 standards(Raster-Anschluss-Steck-Technik) that supporting industrial and appliance safety standards.

### Sustainability :

Flame retardant LFR-5012 offer outstanding sustainability advantages, supporting recycling.

### Packaging & Storage:

Delivered in 25 kg paper bags with PE inliner. Sealed storage in a dry place at room temperature.  
Shelf life: 12 months.

## Flame retardant for LSZH and high flame-retardant polyolefin cables



### Descriptions:

LFR-6002 is a phosphorous based flame retardant, it is a white powder with specially designed particle size distribution and decorated, which is especially suitable for polyolefin cable jacket, optic fiber cable jacket and insulation layer materials.

### Specifications:

Item	Unit	Specification
Phosphorous content	% (w/w)	8.0-10.0
Bulk density	g/cm <sup>3</sup>	0.40-0.80
Moisture(K-F)	% (w/w)	≤0.50
Decomposition Temperature	°C	>220
Average Particle Size(D50)	μm	< 10.0

### Applications:

1. LFR-6002 is suitable for use in polyolefin material (PE, EVA & POE) with the dosage of 50-60% could be achieved Underwriters Laboratories (UL) 94V-0 classification down to 0.8 mm thickness and Limit Oxygen Index(LOI) > 36, as well as reach to the vertical flame grade (single piece and bunch).
2. Low smoke density and toxicity in case of fire, satisfy all smoke toxicity, smoke pH value and conductivity test.
3. Maintain properties of polymer, providing outstanding mechanical properties and elongation at breaks.
4. High hydrophobicity and non-migration to displaying superior processing stability in products.
5. Excellent dispersibility and processability.

### Sustainability:

Flame retardant LFR-6002 offer outstanding sustainability advantages, supporting recycling.

### Packaging & Storage:

Delivered in 15 kg paper bags with PE inliner. Sealed storage in a dry place at room temperature. Shelf life: 12 months.



## Organic phosphorus flame retardant for low smoke and halogen-free Polyamides



### Descriptions:

LFR-6003 is nitrogen and phosphorous based flame retardant, with specially designed particle size distribution and decorated, excellent flame retardancy and smoke suppression.

LFR-6003 is a highly stable non-halogenated flame retardant for PA6,PA66, offering high Limit Oxygen Index(LOI),low smoke density, as well as reach to the vertical flame grade (single piece and bunch),satisfy all smoke toxicity, smoke pH value and conductivity test. Low impact on mechanical properties, could be maximum maintenance the performance of tensile strength and elongation, etc. New solutions promote products with high hydrophobicity, non-migration and UV resistance benefits for rail transit materials, polyimides cable jacket, optic fiber cable jacket, as well as insulation layer materials.

### Specifications:

Item	Unit	Specification
Phosphorous content	% (w/w)	17.0-18.0
Bulk density	g/cm <sup>3</sup>	0.40-0.70
Moisture(K-F)	% (w/w)	≤0.50
Decomposition Temperature	°C	>300
Average Particle Size(D50)	µm	15.0-40.0

### Applications:

1. LFR-6003 is suitable for use in both PA6 and PA66 applications, could be achieved Underwriters Laboratories (UL) 94V-0 classification down to 0.8 mm thickness.
2. LFR-6003 is new additive displaying low smoke density which can make flame retardant polyamides with low smoke and high flame retardant requirements.
3. Maintain properties of polymer, providing excellent mechanical property and elongation at breaks.
4. High hydrophobicity and non-migration to displaying superior processing stability in products.
6. Excellent dispersibility and processability.
7. LFR-6003 provides nice performance to meet the requirements of UL, VDE & CQC.
8. LFR-6003 meeting RAST 2.5 and RAST 5 standards (Raster-Anschluss-Steck-Technik) that supporting industrial and appliance safety standards.
9. Compliant with the stringent fire safety standard for rolling stock applications in the EU (EN 45545-2): Smoke Density Grade (SDR) Ds max. < 150, Limit Oxygen Index(LOI) > 32.

### Sustainability:

Flame retardant LFR-6003 offer outstanding sustainability advantages, supporting recycling.

### Packaging & Storage:

Delivered in 25 kg paper bags with PE inliner. Sealed storage in a dry place at room temperature. Shelf life: 12 months.

## Halogen-free Carrier-Free Grainy Flame Retardant for modified Nylon



### General Description and Use:

LFR-8003L is a halogen-free flame retardant based on phosphorous which is especially suitable for polyamides. It is a white granular with high hydrophobicity, high temperature resistance and non-migration.

- Low dust, Safety & Eco-friendly;
- Readily dispersed;
- More smooth feeding;
- Increased formulation freedom compared to flame-retardant masterbatch with carrier.

### Typical Properties:

Item	Unit	Target value
Appearance	/	White granular
Phosphorous content	% (w/w)	23.0-24.0
Bulk density	g/cm <sup>3</sup>	0.40-0.60
Moisture(K-F)	% (w/w)	≤0.20
Decomposition Temperature	°C	>350
Granular Strength	N	3.0-6.0

### Applications:

1. It is a highly stable flame retardant displaying high efficiency and high adaptability in PA6/PA66/PPA and polyester (PET, PBT), for both glass-fiber-reinforced and unreinforced grades.
2. Classification: Achieves UL 94 V-0 down to 0.4 mm thickness. LFR-8003L can be combination with N-synergists. Dosage: approx. 13-18 parts LFR-8003L / 100 parts resin.

### Packaging and Handling:

#### Delivery form

White powder

#### Packaging:

LFR-8003L is delivered in 25 kg paper bags/ cardboard barrel or 500kg big bags.

#### Storage:

Seal and store in dry, dust-free and cool place.

Minimum shelf life is 12 months from the date of shipping when stored according to the said conditions.

## Halogen-free Carrier-Free Grainy Flame Retardant for PA6/PA66/PPA



### General Description and Use:

LFR-5009L is phosphorous based flame retardant which is developed especially for use in polyamides. It is a white granular with high hydrophobicity, high temperature resistance and non-migration. LFR-5009L when processing at high-temperature showed higher thermal stability, it is suited for PA6/PA66/PPA, for both glass-fiber-reinforced and unreinforced grades.

### Typical Properties:

Item	Unit	Target value
Appearance	/	White granular
Phosphorous content	% (w/w)	24.5-25.5
Bulk density	g/cm <sup>3</sup>	0.40-0.70
Moisture(K-F)	% (w/w)	≤0.50
Decomposition Temperature	°C	>350
Granular Strength	N	3.0-6.0

### Applications:

1. Compliance with RoHS and REACH requirements.
2. LFR-5009L was developed especially for use in polyamides.
3. LFR-5009L when processing at high-temperature showed higher thermal stability and superior processing stability than nitrogen-based flame retardant.
4. Low gas emission and low smoke during processing, effectively reduce corrosion of screws.
5. Suitable for applications in hot and humid environments, minimizes the risk of migration and mold deposits.

### Sustainability:

Flame retardant LFR-5009L offer outstanding sustainability advantages, supporting recycling.

### Storage:

LFR-5009L delivered in 25 kg paper bags/ cardboard barrel or 500kg big bags.

Sealed storage in a dry place at room temperature. Shelf life: 12 months.