

# Tribromophenol

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Common plastics are made from organic materials that are derived from petroleum products and can be highly flammable. Tribromophenol (TBP), sold by LANXESS Solutions US Inc. as PH-73FF™, is used as a raw material in the manufacture of epoxy-based polymers that are used in the manufacture of electronic printed circuit boards in order to reduce their inherent flammability. When reacted to make epoxies, TBP is chemically transformed and no longer exists. TBP is incorporated into the epoxy matrix because it can help prevent it from igniting or, if ignition does occur, will help slow the spread of fire and allow more escape and response time. TBP is not a consumer product and is manufactured and handled only in industrial facilities.

## Identification

Tribromophenol is referred to by several different names including:

- TBP
- PH-73FF
- 2,4,6 tribromophenol
- CAS Number 118-79-6

TBP is able to inhibit the flammability properties of plastics because it contains bromine, a halogen which is particularly efficient at interrupting the mechanisms that otherwise initiate and propagate fire.

## Description

### Production:

During production, the raw materials of TBP are combined in production units designed for the manufacture of chemicals. The resulting reaction product is further refined to meet specifications and then packaged in bulk and smaller packages for distribution to industrial customers that use it to reduce the flammability of their products.

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### Uses:

TBP is used as a raw material for a chemical reaction where, along with other ingredients, it is transformed into an epoxy polymer that is used to make flame-resistant circuit boards for electronic devices. Epoxies are “built” using petroleum-based chemicals and consequently can be highly flammable, if left unmodified. After TBP is incorporated into the circuit board, it is less likely to ignite. If ignition does occur, the fire will spread more slowly than if the board was left untreated.

### Properties:

Appearance: off-white-powder

Melting Range: 91-95 °C

Water Solubility: <0.1 g/100 g

## Potential Human Health Effects

### Health Effects:

TBP is irritating to the eyes and can cause skin sensitization and allergic reactions. However, TBP is safe to use in industrial settings equipped with suitable engineering controls, when appropriate personal protective equipment is worn and when proper hygiene measures are followed after use.

Excessive exposure to TBP is unlikely to occur under normal working conditions in an industrial setting. In the unlikely event that high-level exposure did occur, TBP is generally considered to be a moderate health risk, primarily due to concerns associated with possible skin and eye exposure.

TBP exposure due to dust formation when the product bags are being emptied in an industrial setting is the most likely avenue of worker exposure. Dust that is inhaled could irritate the respiratory system, if poor ventilation is employed or protective respiratory equipment is not worn. Dust in the air could land in the eyes as a particulate where it could cause severe eye irritation. Dust could also land on exposed skin, causing skin sensitization or an allergic reaction.

Just as with aspirin, water, alcohol, bathroom cleaner and other commonly used chemicals and materials, TBP does have an inherent level of toxicity that must be understood and safeguarded against through the use of engineering controls, personal protective equipment and through appropriate procedures. The Safety Data

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Sheet (SDS) is the best resource to consult for understanding the health hazards and risks associated with TBP.

No known negative health effects exist for users of the polymers that are made using TBP.

### **Industrial Use:**

TBP is used in well-controlled manufacturing facilities by people trained in the hazards of polymer additives and chemicals using best practice techniques developed to minimize dust and exposure. Typically, processing sites utilize engineered systems to minimize the potential for exposure to all chemicals used in the process. An unplanned release or spill of TBP represents a moderate health concern due to the impacts it may have to the eye and skin, but it is not expected to represent an acute life-threatening situation. In any spill or release incident, all non-essential personnel are immediately evacuated upwind of the spilled material. All personnel involved with correcting a spill situation are trained and properly equipped with the required personal protective equipment.

### **Consumer Use:**

It is unlikely that consumers would be exposed to TBP in its concentrated form, because it is only sold for industrial use to make polymers and is not sold directly to consumers. After used to make epoxies, exposure to TBP is not possible, because it has been transformed into a polymer and no longer exists.

### **Environmental Release:**

When used in an industrial setting, TBP is typically handled using engineered systems designed to minimize any release to the environment.

TBP that is released to the environment will collect on hard surfaces and will potentially mix with soil or other porous materials. Contained quantities of TBP should be collected. Soils contaminated by spills should be collected and disposed of in an appropriate manner.

### Physical Hazards

TBP sold by Great Lakes Solutions as PH-73FF™ is a dry, off-white coarse powder or a similarly colored briquette and has a characteristic odor. It is non-flammable and slightly water soluble.

### Potential Environmental Impact

#### Environmental Fate Information:

TBP powder that is released to the environment is expected to readily biodegrade. Proactively taking steps to minimize release of TBP powder to the environment represents industry best practice. TBP powder that has been embedded into a polymer matrix is not readily released into the environment. TBP that has been reacted and transformed into a resin for circuit board manufacture cannot be released into the environment as TBP, because it has chemically combined with other materials to make a new polymer and no longer exists as the same, original substance.

#### Aquatic and/or Terrestrial Toxicity:

Releases of TBP to the aquatic or terrestrial environment should be avoided. TBP is classified as being very toxic to aquatic life. Soils that are contaminated by spills must be collected and disposed of in an appropriate manner.

### Product Stewardship

#### Manufacturing locations:

Facility management procedures, SDS, technical guidance documents, and training are available to communicate safe handling, risk mitigation measures and emergency response information requirements to employees at manufacturing locations. Appropriate local exhaust ventilation and personal protective equipment should be used in industrial locations where TBP is handled.

#### Environment:

Managing emissions during manufacture and processing of polymer additives is the focus of the Voluntary Emissions Control Action Program (VECAP), a product stewardship initiative introduced and managed by major manufacturers of treatments to reduce the flammability of plastic products. VECAP is used by our industry to partner with the supply chain to understand, control and reduce releases into the environment through application of best practices.

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LANXESS Solutions US Inc. further recommends that solid waste and packaging waste be either incinerated with an adequate gas cleaning system or sent to a controlled landfill.

### **Consumers:**

Consumers are not likely to be exposed to TBP distributed by LANXESS Solutions US Inc. because it is not sold directly to consumers, nor do we endorse sales to consumer markets. TBP is transformed into an epoxy polymer when used in the production of circuit boards.

LANXESS Solutions US Inc. conducts an ongoing analysis of its products to evaluate potential risk areas throughout the product's life cycle. Chemical risks are identified at the very early stage of new products. They are evaluated by stage-gated reviews using environmental, health and safety (EHS) criteria. The analysis of existing products will evaluate raw materials, manufacturing, transportation, customer end-use and disposal. Additionally, before changes in existing product formulations are made, a detailed evaluation is made of the proposed change. A critical component of all of these processes is the SDS, which lists detailed product hazard information.

Potential product risks that are identified are managed using internal and external controls. In the context of a continually improving risk-reduction program, periodic reviews of the current controls are conducted in order to identify opportunities for improvements or enhancements. This includes adaption of existing procedures to changes in regulations (e.g., covering workplace and transportation).

### **Conclusion**

TBP is a substance with a unique ability to provide flame retardant properties to epoxy polymers used to make circuit boards in a manner that maintains the needed performance characteristics. Though there are potential hazards associated with TBP, it is only handled by highly trained people in manufacturing environments utilizing specialty equipment, safety controls, and personal protective equipment.

### **Contact Information**

LANXESS Solutions US Inc.  
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### Notices

#### Use and Application Information

The manner in which you use and the purpose to which you put and utilize our products, technical assistance and information (whether verbal, written or by way of production evaluations), including any suggested formulations and recommendations are beyond our control. Therefore, it is imperative that you test our products, technical assistance and information to determine to your own satisfaction whether they are suitable for your intended uses and applications. This application-specific analysis must at least include testing to determine suitability from a technical as well as health, safety, and environmental standpoint. Such testing has not necessarily been done by us. Unless we otherwise agree in writing, all products are sold strictly pursuant to the terms of our standard conditions of sale. All information and technical assistance is given without warranty or guarantee and is subject to change without notice. It is expressly understood and agreed that you assume and hereby expressly release us from all liability, in tort, contract or otherwise, incurred in connection with the use of our products, technical assistance, and information. Any statement or recommendation not contained herein is unauthorized and shall not bind us. Nothing herein shall be construed as a recommendation to use any product in conflict with patents covering any material or its use. No license is implied or in fact granted under the claims of any patent.