DuPont™ Teflon®

Industrial Coatings

Safe Handling Practices

A handbook entitled "Guide to the Safe Handling of Fluoropolymer Resins," latest edition, is available from The Society of the Plastics Industry (SPI), 1275 K Street, N.W., Suite 400, Washington D.C. 20005 (202) 371-5233. DuPont contributed information to the SPI handbook and we recommend its use for safe handling information. *Teflon*® coatings are based on *Teflon*® fluoropolymer resins, and the information below is provided as a supplement to the "Guide to the Safe Handling of Fluoropolymer Resins."

General Comments

Since their discovery, millions of pounds of *Teflon*® fluoropolymer resins have been processed at temperatures in excess of 350°C (662°F), and subsequently placed in end-use applications, many of which have been at or above the rated use temperatures. During this period, spanning more than 50 years, there have been no reported cases of serious injury, prolonged illness, or death resulting from the handling of the resins. This record includes the experience of DuPont personnel, hundreds of processors, and thousands of end-users who handle these resins every day.

While most inorganic engineering materials, such as metals or ceramics, simply soften and lose strength when overheated, plastics and other organic materials also undergo some decomposition or actual breakdown in chemical structure. The products thus formed are usually given off in the form of gases or fumes. Fumes from the pyrolysis of many resins and elastomers, as well as those from naturally occurring polymers like rubber, coal, silk, and wood, may be toxic. Therefore, the ventilation precautions to be observed when heating *Teflon*® resins are similar to those which should be observed when heating such conventional materials.

The high temperature ratings of *Teflon*® resins result from their extremely low rate of thermal decomposition. Even in cases of severe overheating, the quantity of fumes evolved is minute in comparison with that from most organic materials. Even though small in quantity, adequate ventilation should be provided in situations where exposure of personnel can occur.

Even with good engineering controls, however, it is recommended that operators use a respirator (see Recommended Personal Protective Equipment), especially those operators involved in hand-spraying or spray gun/spray booth maintenance procedures.

Special care should be observed in spraying the 850 Line PTFE primers with 850-7799, and 851-204 PTFE one coat/primer, because of the strong acids involved (pH approximately 1.5).

Special spray booth design and operation requirements are needed for the application of *Teflon*® powder coatings. Overspray escape conditions can be minimized by establishing a spray booth maintenance schedule that includes the routine cleaning or replacement of filters and periodic monitoring of air flow face velocities. Automatic spray guns should be properly oriented so that the spray pattern is not directed toward any booth openings. Adjust spray guns to use the minimum atomization pressure,

fluid pressure, and spray pattern to suit the job. Avoid strong drafts from any nearby open windows or other building ventilation systems that might adversely affect the operation of the spray booth. If it is necessary to enter the spray booth for any reason, a respirator should be worn and any overspray mist should first be allowed to fully exhaust.

Safe Handling Procedures

Industrial experience has clearly shown that *Teflon*® coatings can be handled, applied, and cured at elevated temperatures without hazard to personnel providing that good industrial practices are observed. The following is a list of general precautions that should be taken when processing *Teflon*® coatings (refer to the individual "Fact Sheets" for any special precautions).

- Keep away from heat and open flame.
  - Some *Teflon*® coatings are flammable, many are combustible.
  - Keep the lid on the container when not in use.
  - Smoking should be prohibited in areas where *Teflon*® products are handled, applied, or baked, and "No Smoking" signs should be prominently displayed.
- Use only with adequate ventilation.
  - Avoid breathing vapor, spray mist, and fumes from baking equipment.
  - Open containers in well-ventilated areas.
  - Some products may irritate skin and eyes.
  - Some products may liberate vapors that may be harmful.
- Avoid contact with the skin and eyes.

  In case of contact, flush skin or eyes with plenty of water for at least 15 minutes until any burning sensation is eliminated. For eyes, get medical attention immediately.

  CAUTION: Additional care must be exercised to prevent skin and eye contact when handling the acid-containing products, 850-7799 and the 850 Line primers it is mixed into, and 851-204 PTFE one coat/primer. When agitating, filtering, or transferring these materials, neoprene gloves, a face shield and protective clothing are strongly recommended. A NIOSH-approved paint spray respirator should be used when spraying these products.
- Observe good personal hygiene practices.

  Wash hands thoroughly after handling, especially before eating or smoking. The following should be prohibited in the areas where *Teflon*® products are handled, applied, or baked:
  - Eating, drinking, or carrying food or cosmetic products
  - Carrying exposed cigarettes or other tobacco products

Recommended Personal Protective Equipment

- For Spray Application—Respiratory: Do not breathe vapors or mists.

  Wear a properly fitted vapor/particulate respirator approved by NIOSH/MSHA (TC-23C) for use with paints during application and until all vapors and spray mist are exhausted. Follow the respirator manufacturer's directions for respirator use. For prolonged hand-spraying operations, an air-supplied respirator or hood may be preferable. Safety glasses, coveralls, and neoprene gloves are also recommended.
- Respirators are not usually required in the baking area where properly operated and ventilated ovens are used. If ventilation conditions are suspect, a respirator should be required. An air-supplied respirator or hood or a NIOSH/MSHA-approved chemical cartridge respirator with organic vapor cartridges in combination with a high-efficiency particulate filter is recommended*.
- For general handling (pouring, reducing, filtering, mixing):
  - Safety glasses
  - Full face shield when handling acids
  - Neoprene gloves
  - Coveralls
  - Neoprene apron (optional)

Removal of *Teflon*® Films

Grit blasting is the only recommended method of removing fully cured *Teflon*®.

CAUTION: Although this method has been used extensively and safely for many years, a potential fire/explosion hazard exists if the *Teflon*® and metal dusts generated from this operation are heated to 424°C (796°F).

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* Under federal regulation (General Industry OSHA Safety & Health Standards, 29 CFR.1910 Series, 1910.134), employers who provide respirators are required to train and fit employees in their use.

Although solid films of *Teflon*® coatings do not present any particular fire hazard, small particles (fines) of these films can become extremely combustible in the presence of various metal fines when exposed to temperatures above 424°C (796°F). An intimate mixture of such finely divided fluorocarbon and metal powder (e.g., aluminum, magnesium) particles will react violently when subjected to high temperatures and the resulting fire can only be extinguished by radically lowering the temperature of the material. It may be possible to generate such mixtures from operations such as belt sanding, grit blasting with abrasives for reclaiming previously coated parts or from grinding or buffing operations to remove cured coatings.

Good housekeeping and compliance to governmental law and fire/insurance codes should prevent the accumulation of these fines mixtures, but when their collection is absolutely necessary, they should be maintained in a wet state. If ventilation is used as the primary method of dust control, a maintenance schedule should be established to keep the system in efficient working order. In all cases, adequate means of quenching heat quickly (e.g., sprinkler systems, water-based portable fire extinguishers) should be accessible in all vulnerable locations. In addition, the fluorocarbon dust can contaminate cigarettes or other tobacco products which subsequently may lead to polymer fume fever. It is important, therefore, that good housekeeping practices be observed in the area where grit blasting operations are performed.

Cured *Teflon*® S films can sometimes be removed by immersion in commercially available alkaline paint strippers.

Under no circumstances is high-temperature burn-off recommended.

Polymer Fume Fever

Human exposure to heated *Teflon*® resins may cause a temporary flu-like condition similar to the metal fume fever (or foundryman's fever) known for many years. These symptoms, called "polymer fume fever," are the only adverse effects observed in humans to date. No lethal effect has been observed. The symptoms do not ordinarily occur until about two or more hours after exposure, and pass within 36 to 48 hours, even in the absence of treatment. Observations indicate that these attacks have no lasting effect and that the effects are not cumulative. When such an attack occurs, it usually follows exposure to vapors evolved from the polymer at high temperatures used in the baking operation, or from smoking cigarettes or tobacco contaminated with the polymer. If such attacks occur, it is recommended that the patient be removed immediately to fresh air and that a physician be called.

Fire Hazard

Sintered *Teflon*® films have a comparatively low fuel value and, in a fire situation, resist ignition and do not themselves promote flame spread. When ignited by sustained flame from other sources, their contribution of heat to the fire is exceptionally low and at a relatively slow rate.

In the liquid state, solvent-based *Teflon*® coatings are flammable or combustible and should be used in well-ventilated areas where smoking is prohibited. Although not as obvious, many water-based *Teflon*® products, even though they may not support combustion, exhibit a flash point and must be treated as combustible liquids.

In the event of a fire, personnel entering the area should have full protection, including acid-resistant clothing and self-contained breathing apparatus with full face piece operated in the pressure-demand or other positive pressure mode. In case of direct exposure to combustion products, the affected areas should be washed promptly with copious amounts of water.

In the case of exposure of the eyes, medical attention should be provided as soon as they have thoroughly flushed with water.

(Also see section titled "Removal of *Teflon*® Films").

For more information on Teflon® coatings:

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