

# DuPont™ Zonyl® RP Paper Fluoro-Protectant

## Technical Information

### Description

Zonyl® RP is an anionic fluoro-protectant that imparts oil and grease repellency to a wide variety of paper and paperboard products. Application of 0.1 lb of Zonyl® RP as received per 1,000 ft<sup>2</sup> or 8 lb/ton usually provides sufficient oil and grease repellency. The versatility of Zonyl® RP, along with compatibility to many other anionic or nonionic paper chemicals, allows application by most papermaking, treating, and converting operations. Surface treatment using a size press is preferred, as it is the most efficient and economical method of fluorochemical application.

### Food Packaging Status

Zonyl® RP is listed in the Code of Federal Regulations\*, Food and Drugs, 21 CFR 176.170, components of paper and paperboard in contact with nonalcoholic aqueous and fatty foods, Conditions of Use B through H. The limitations and Conditions of Use are defined as:

- A maximum treatment level of 0.17 lb Zonyl® RP solids per 1,000 ft<sup>2</sup> of paper or paperboard. (Zonyl® RP has 34% solids.)
- Conditions of Use B through H of 21 CFR 176.170 are shown below:
  - B – Boiling water sterilized
  - C – Hot filled or pasteurized above 66°C (150°F)
  - D – Hot filled or pasteurized below 66°C (150°F)
  - E – Room temperature filled and stored (no thermal treatment in the container)
  - F – Refrigerated storage (no thermal treatment in the container)
  - G – Frozen storage (no thermal treatment in the container)
  - H – Frozen or refrigerated storage (ready prepared foods intended to be reheated in the container at time of use):
    - Aqueous or oil-in-water emulsion of high or low fat
    - Aqueous, high or low free oil or fat

\* Federal regulations specify total fluorine content. Broke, secondary fiber containing fluorochemical and small amounts of fluorides in pulp and water can contribute to total fluorine content.

### Application

#### Equipment

Zonyl® RP can be applied on or off the paper machine. Convenient locations are at the size press, coating station, calender stack waterbox, gravure or flexographic press, wire wound rod, or trailing blade and roller coaters. In short, any equipment that can apply uniform coating of water solutions to paper or board can usually apply Zonyl® RP successfully. Surface treatment is preferred, as it offers wide versatility in location and equipment while providing a less expensive and more easily controlled application than internal treatments.

#### Treatment Level

Treatments can be made to one side or both sides of the paper or paperboard. The concentration of Zonyl® RP required for a given degree of oil or grease holdout depends upon several factors:

- The oil or grease being held out
- Time and conditions for holdout
- Nature of the fiber finish
- Presence of other chemicals on the sheet
- Papermaking variables, such as stock freeness, density, and degree of calendering

In most cases, the greater the amount of fluorochemical on the surface of the treated paper or paperboard, the greater the oil and grease repellency. Variations in alum, filler, size, starch, and other sheet or treatment parameters may affect holdout. For an initial trial, the recommended rate is 0.1 lb Zonyl® RP as received per 1,000 ft<sup>2</sup>.



*The miracles of science™*

### *Solution pH*

The treating solution pH has little effect on Zonyl® RP over a pH range of 6–10. Performance is slightly better for solutions of pH 9–10.

### *Water Hardness*

Water used to make the treating solution must be soft (less than 50 ppm hardness) or have sufficient chelating agent added (according to the manufacturer's recommendation) to control hard water ions. Failure to soften the water will reduce repellency by precipitating product. Softening agents such as Versene® Powder or Versene® 100 (Dow Chemical Co.) are recommended. The level of Versene® will vary with water hardness, but, generally, 0.1% Versene® 100 is sufficient.

### *Sizing Agents and Alum*

Internal sizing, such as rosin and alum, can reduce penetration of the Zonyl® RP treating solution, resulting in a nonuniform, shallow treatment. Therefore, internal size should be avoided or minimized. Alum can cause precipitation of the fluoridizer at the surface of the sheet. Alum should be eliminated or minimized using a chelating agent (Versene® Powder or Versene® 100). Where lower pH is required, sulfuric acid can be substituted for alum.

### *Mineral Fillers*

Mineral fillers in the sheet also reduce the effectiveness of Zonyl® RP. Fillers increase the surface area and require more fluorochemical to provide repellency.

### *Thickeners and Film Formers*

Zonyl® RP is compatible in solution with most thickeners and film formers, such as unmodified starch, acid-hydrolyzed or enzyme-converted starch, ethylated starch, Elvanol® polyvinyl alcohol, sodium alginate, casein, protein, and sodium CMC. These products can also be added to Zonyl® RP to minimize sheet penetration, if resistance to scoring or folding is unimportant. Chlorinated or oxidized starches should be avoided.

### *Preparation of Zonyl® RP Treating Solution*

- Because of its surfactant nature, Zonyl® RP can foam if the product is mishandled. Keep the temperature as low as practical for the equipment and conditions. Avoid unnecessary aeration of the Zonyl® RP by using low shear mixing equipment and minimizing solution free fall.
- Avoid the use of excessive chelating agents (Versene®). If a chemical antifoam is required, one of the following, or an equivalent product, is suggested:
  - Antifoam FG-10 (Dow Corning)
  - Defoamer 831 (Hercules, Inc.)
- Using soft water (less than 50 ppm total hardness), add all other required materials (starch, sodium CMC, PVA, wetting agent, etc.) to the solution. The solution should be thoroughly mixed or blended prior to the addition of Zonyl® RP.
- **Ensure all additives are compatible with Zonyl® RP prior to application.**
- Zonyl® RP must be thoroughly mixed to resuspend any settled solids back into solution. Use a drum roller at low speed for a period of time prior to sampling for consistency.
- Lastly, add sufficient Zonyl® RP to obtain repellency. It is recommended that the Zonyl® RP be diluted to 1% with water. If necessary, Zonyl® RP can be added at full strength and should be uniformly distributed in the solution by gentle but complete mixing. Uneven application generally results in reduced oil repellency.

## Testing

Determining the amount applied is generally done by controlling wet pickup or, if greater accuracy is needed, by fluorine analysis. The presence of Zonyl® RP can be qualitatively detected by placing a drop of oil on the surface of the paper or paperboard. Fluorochemical will cause the oil drop to “bead,” whereas a film coating such as polyethylene will allow the oil to “flow” or lay flat. The more fluorochemical present, the greater the contact angle. To minimize treatment cost and avoid unnecessary expense, it is important to keep in mind the intended use of the paper or paperboard and design testing around end-use conditions.

## Personal Safety, First Aid, and Storage and Handling

Zonyl® RP is classified by DOT as a flammable liquid, N.O.S. (Isopropanol) Hazard Class 3. It should be stored in a well ventilated place, away from open flames or heated surfaces. See the Material Safety Data Sheet (MSDS) for further information.

Zonyl® RP should be stored above 5°C (41°F) to reduce settling.

**Do not apply Zonyl® RP using aerosol application or by atomization.** Inhalation of spray or mist may cause nasal, throat, or lung irritation. Inhalation of large amounts of respirable particles may be toxic to the lungs. Symptoms may be modest initially, followed in hours by severe shortness of breath requiring prompt medical attention.

## Technical Assistance

For help in evaluating this product in your application, please call DuPont Technical Service at (800) 255-4596.

## Ordering Information—Product, Literature, or Samples

To order samples or literature, please call (800) 255-4596. For commercial quantities, please call (800) 441-9504. For locations outside the United States, contact the local DuPont representative in your country.

## U.S. Sales and Services

---

For placing orders or requesting additional product information, please use our convenient 24-hour, toll-free telephone number. If you prefer, you can write to us.

*By Phone*

Toll free in continental U.S.  
(800) 441-7515

*By Mail*

DuPont Chemical Solutions Enterprise  
Customer Service Center  
Barley Mill Plaza, Bldg. 23  
Wilmington, DE 19898

---

The information set forth herein is furnished free of charge and is based on technical data that DuPont believes to be reliable. It is intended for use by persons having technical skill and at their own discretion and risk. Because conditions of use are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information. Nothing herein is to be taken as a license to operate under or a recommendation to infringe any patents.

The DuPont oval logo, DuPont™, The miracles of science™, Elvanol®, and Zonyl® are trademarks or registered trademarks of DuPont.

Versene® is a registered trademark of Dow Chemical Co.

Copyright © 2002 E.I. du Pont de Nemours and Company. All rights reserved.



*The miracles of science™*