



**POLYFOX™**

*the friendly fluorosurfactant*

## Improved Performance PUDs Containing PolyFox Fluorochemicals

### DESCRIPTION

OMNOVA Solutions offers an anionic aliphatic lightfast translucent waterborne polycarbonate urethane polymer chemically modified with PolyFox™ fluorochemicals incorporated into the resin to impart enhanced surface properties such as stain resistance, scratch and mar resistance and durability when crosslinked. These PUD's can be applied to a wide variety of substrates.

### CHARACTERISTICS and ADVANTAGES

- \* Excellent adhesion to wide range of flexible and rigid substrates
- \* Forms glossy, ultra hard films with enhanced durability
- \* Excellent hydrolysis, water, and stain resistance
- \* Outstanding weather, chemical, and solvent resistance

### APPLICATION METHODS

Spray, knife over roll, rotogravure or saturant

### TYPICAL PHYSICAL PROPERTIES

Appearance	Translucent
Weight per Gallon	8.8 lbs
Viscosity	50 - 200 cps
VOC	2.8 lbs/gal
Solids Content	35 - 40%
Softening Point	370° F
pH	7.5 - 9
Cleaning Solvent	Water

### TYPICAL TENSILE PROPERTIES

Tensile Strength	5400 - 8000 psi
Elongation	25 - 50%
Modulus (15%)	2500 - 5000 psi
Gloss	70
Sward Hardness	50 - 55

### RECOMMENDED CROSSLINKER

OMNOVA Solutions' AT-1093 and 1094 experimental products may be crosslinked with polyaziridines, water dispersible polyisocyanates, epoxy silanes or low temperature curing melamines to increase bond strength and heat resistance.

## PREPARATION OF PUDs CONTAINING POLYFOX

### Reaction Procedure Guidelines:

The chosen polyols were dried under reduced pressure at a temperature of 70°C. The chosen isocyanates were used as received from the manufacturer.

The reaction between the polyols and the isocyanate was carried out in a 100-ml three-necked flask equipped with a high speed stirrer, thermometer, reflux condenser and a nitrogen inlet-outlet. A continuous flow of nitrogen was maintained throughout the reaction.

The reaction vessel was charged with 0.46pbw (parts by weight) PolyFox diol PF-636, 27.79 pbw Lexorez 1600-55, a linear polyester polyol, and a dispersant containing acid groups such as dimethylolpropionic acid (1.8 pbw), which had been dissolved in N-methylpyrrolidone (NMP) (2.0 pbw).

The reactants were mixed and heated to 110-115°C. After 10 minutes, the reactor was cooled to 37°C and dibutyl tin dilaurate (DBTDL) (T-12) was added at 0.01 pbw.

The contents were stirred for 5 minutes at temperature.

The temperature was then increased to 65°C and 11.08 pbw Desmodur I (Isophorone di-isocyanate) was added with vigorous stirring throughout the addition, to ensure good mixing.

Samples of the reaction mixture were taken to determine the amount of unreacted isocyanate using the di-n-butylamine method (ASTM D-1638-74), with a target of 4.6%.

After two hours the target isocyanate level was reached and the reaction products were cooled to 45°C.

A tertiary amine, triethyl amine (TEA) was added to the reaction at 1.4 pbw at a temperature of about 50-80°C. The reaction was allowed to proceed, with stirring, for 30 seconds to facilitate neutralization of the acid groups from dimethylolpropionic acid (DMPA).

While stirring at a high rate (2000 rpm) 54.3 pbw water was added to the polyurethane prepolymer.

The reaction was then cooled to room temperature and a dispersion was obtained having a solids content of approximately 44%.

Ethylenediamine (EDA), 0.67 pbw was then added as a chain extender to complete the reaction.

A stable anionic, waterborne polyurethane dispersion having a viscosity of less than 140 cps and a solid content of 44% resulted.

Typical "paints" were formulated from these modified PolyFox PUDs, demonstrating significantly improved resistance to ethylene glycol (no effect), and gasoline (no effect), as well as a significant reduction in coefficient of friction.

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#### NOTE:

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