# ECM Duro-Bond Polypropylene Sheet Lining

## Description

**Duro-Bond Polypropylene** is a laminated sheet of polypropylene and natural rubber that forms an excellent chemically resistant membrane that is readily bonded to steel, concrete, or FRP substrates. Polypropylene is a thermoplastic resin that is melt flow processible. Duro-Bond Polypropylene sheet lining is available in thicknesses of 90 mils (2.3 mm) and 125 mils (3.0 mm).

## Uses

**Duro-Bond Polypropylene** is particularly resistant to attack by mineral acids including the oxidizing acids, such as nitric and sulfuric.

**Duro-Bond Polypropylene** can be bonded to various substrates. It-is used for lining plating tanks, acid etch tanks, pickling tanks, process vessels, neutralization tanks, drip pans, ventilation hoods and ducts.

## Advantages

The polypropylene layer, which is exposed to the solution being processed, provides the wide range of chemical resistance typical of polypropylene material. The natural rubber layer provides a flexible bond to the substrate which allows for the differences in thermal expansion.

Since curing or vulcanizing is not required, **Duro-Bond Polypropylene** can be shop or field installed. **Duro-Bond Polypropylene** has good non-stick properties and is highly recommended as a lining material for chutes and hoppers.

## Service Temperature

The maximum continuous service temperature for which **Duro-Bond Polypropylene** can be used is 212$^{o}$F (100$^{o}$C). Corrosion resistant brick sheathing joined with one of the Electro Chemical Manufacturing corrosion resistant cements is used in conjunction with **Duro-Bond Polypropylene** when excessive temperatures are present. A 4" thick brick sheathing will provide a temperature drop of approximately 50 $^{o}$F and an 8" brick lining will provide a drop of approximately 100 $^{o}$F. When carbon brick are used the temperature drop will be somewhat less.

## Chemical Resistance

The information listed may be considered as a basis for recommendation, but not as a guarantee, unless sold and installed by **Electro Chemical Manufacturing.** For resistance of **Duro-Bond Polypropylene** to chemicals not listed, contact us at 330-313-6372, knightmaterials.com, or info@knightmaterials.com.

The following table lists a number of chemicals at various concentrations and indicates the maximum operating temperatures at which **Duro-Bond Polypropylene** may be recommended in contact with these chemicals.

**Key to Ratings:**

S = Satisfactory
F = Fair
P = Poor
U = Unsatisfactory
- = No Information

| Chemical | Conc.(%) | Temperature 72 °F | 140 °F | 212 °F |
|---|---|---|---|---|
| Acetic Acid (glacial) | 97 | S | F | P |
| Acetic Acid | 80 | S | F | P |
| Acetic Acid | 40 | S | F | P |
| Acetic Acid | 10 | S | S | F |
| Acetone | 100 | S | S | - |
| Aluminum Chloride | Sat'd | S | S | S |
| Aluminum Fluoride | Sat'd | S | S | S |
| Aluminum Sulfate | Sat'd | S | S | S |
| Ammonia gas (dry) | 100 | S | S | S |
| Ammonium Carbonate | Sat'd | S | S | S |
| Ammonium Chloride | Sat'd | S | S | S |
| Ammonium Fluoride | Sat'd | S | S | S |
| Ammonium Hydroxide | 10 | S | S | S |
| Ammonium Nitrate | Sat'd | S | S | S |
| Ammonium Sulfate | Sat'd | S | S | S |
| Amyl Alcohol | 100 | S | S | F |
| Aniline | 100 | S | S | S |
| Antimony Chloride | Sat'd | S | S | F |
| Aqua Regia | | F | F | U |
| Barium Carbonate | Sat'd | S | S | S |
| Barium Chloride | Sat'd | S | S | S |
| Barium Hydroxide | Sat'd | S | S | S |
| Barium Sulfate | Sat'd | S | S | S |
| Benzene | 100 | F | U | U |
| Benzyl Alcohol | 100 | S | S | P |
| Boric Acid | Sat'd | S | S | S |
| Brine | Sat'd | S | S | S |
| Bromine (liquid) | 100 | P | - | - |
| Bromine Water | Sat'd | P | - | - |
| Butyl Acetate | 100 | F | U | U |
| Calcium Carbonate | Sat'd | S | S | S |
| Calcium Chlorate | Sat'd | S | S | S |
| Calcium Chloride | Sat'd | S | S | S |
| Calcium Hydroxide | Sat'd | S | S | S |
| Calcium Hypochlorite | Sat'd | S | F | F |
| Calcium Nitrate | Sat'd | S | S | S |
| Calcium Sulfate | Sat'd | S | S | S |
| Carbon Disulfide | 100 | F | U | - |
| Carbon Tetrachloride | 100 | U | U | U |
| Carbonic Acid | 100 | S | S | S |
| Chlorine (liquid) | 100 | P | P | - |
| Chlorosulfonic Acid | 100 | U | U | U |
| Chromic Acid | 80 | S | F[1] | P |
| Chromic Acid | 50 | S | F[1] | P |
| Chromic Acid | 10 | S | S | F[1] |
| Citric Acid | 100 | S | S | S |
| Copper Chloride | Sat'd | S | S | S |
| Copper Cyanide | Sat'd | S | S | S |
| Copper Nitrate | Sat'd | S | S | S |
| Copper Fluoride | Sat'd | S | S | - |
| Copper Sulfate | 25 | S | S | S |
| Cuprous Chloride | Sat'd | S | S | S |

| Chemical | Conc.(%) | Temperature 72 °F | 140 °F | 212 °F |
|---|---|---|---|---|
| Cyclohexanol | 100 | S | F | - |
| Cyclohexanone | 100 | F | P | - |
| Diethanolamine | 100 | S | S | - |
| Dioxane | 100 | F | F | - |
| Ethyl Acetate | 100 | F | P | U |
| Ethyl Alcohol | 96 | S | S | F |
| Ethylene Glycol | 100 | S | S | - |
| Ethanolamine | 100 | S | S | - |
| Ethyl Ether | 100 | F | - | - |
| Ethyl Chloride | 100 | P | P | - |
| Ethylene Oxide | 100 | F | - | - |
| Ferric Chloride | Sat'd | S | S | S |
| Ferric Nitrate | Sat'd | S | S | - |
| Ferric Sulfate | Sat'd | S | S | S |
| Ferrous Chloride | Sat'd | S | S | - |
| Ferrous Sulfate | Sat'd | S | S | S |
| Fluosilicic Acid | | S | S | - |
| Formaldehyde | 40 | S | S | - |
| Formic Acid | 100 | S | - | - |
| Formic Acid | 10 | S | S | - |
| Furfural | 100 | P | P | - |
| Gasoline | 100 | F | P | - |
| Glucose | Sat'd | S | S | - |
| Glycerine | 100 | S | S | S |
| Hydrobromic Acid | 50 | S | S | - |
| Hydrochloric Acid | 30 | S | S | U |
| Hydrochloric Acid | 10 | S | S | F |
| Hydrochloric Acid | 2 | S | S | S |
| Hydrofluoric Acid | 70 | U | U | U |
| Hydrofluoric Acid | 40 | S | F | U |
| Hydrofluoric Acid | 20 | S | S | F |
| Hydrofluoric Acid | 5 | S | S | F |
| Hydrogen Peroxide | 30 | S | F | U |
| Hydrogen Peroxide | 3 | S | F | F |
| Hydrogen Peroxide | 1 | S | S | S |
| Hydrogen Sulfide | 100 | S | S | - |
| Isopropyl Alcohol | 100 | S | S | - |
| Lactic Acid | 20 | S | S | - |
| Lubricating Oil | 100 | S | F | - |
| Magnesium Carbonate | Sat'd | S | S | S |
| Magnesium Chloride | Sat'd | S | S | S |
| Magnesium Hydroxide | Sat'd | S | S | S |
| Magnesium Nitrate | Sat'd | S | S | S |
| Magnesium Sulfate | Sat'd | S | S | S |
| Mercuric Chloride | 40 | S | S | - |
| Mercuric Cyanide | Sat'd | S | S | - |
| Mercury | 100 | S | S | S |
| Mercurous Nitrate | Sat'd | S | S | - |
| Methyl Ethyl Ketone | 100 | S | P | - |
| Methyl Alcohol (Methanol) | 100 | S | S | - |
| Methylene Chloride | 100 | P | P | P |
| Mineral Oil | 100 | S | S | F |
| Monochloroacetic Acid | 100 | S | S | F |

| | | | | |
|---|---|---|---|---|
| Naphtha | 100 | S | - | - |
| Naphthalene | 100 | S | S | S |
| Nickel Chloride | Sat'd | S | S | S |
| Nickel Nitrate | Sat'd | S | S | S |
| Nickel Sulfate | Sat'd | S | S | S |
| Nitric Acid[2] | Fuming | P | P | U |
| | | Temperature | | |
| Chemical | Conc.(%) | 72 °F | 140 °F | 212 °F |
| Nitric Acid[2] | 70 | S | P | U |
| Nitric Acid[2] | 50 | S | F | P |
| Nitric Acid[2] | 15 | S | F | P |
| Nitric Acid[2] | 10 | S | S | F |
| Nitro Benzene | 100 | S | S | - |
| Oils (essential) | 100 | S | S | - |
| Oxalic Acid (aqueous) | 50 | S | F | - |
| Phenol | 100 | S | S | F |
| Phosphoric Acid | 95 | S | S | S |
| Phosphoric Acid | 85 | S | S | S |
| Phosphoric Acid | 50 | S | S | S |
| Phosphoric Acid | 25 | S | S | S |
| Plating Solutions: (Concentrations as normally used in the plating industry) | | S | S | - |
| Potassium Salts: (Same as Sodium Salts listed below) | | | | |
| Propyl Alcohol | 100 | S | S | - |
| Propionic Acid | 100 | F | P | U |
| Pyridine | 100 | S | - | - |
| Silver Nitrate | Sat'd | S | S | - |
| Sodium Acetate | Sat'd | S | S | S |
| Sodium Bicarbonate | Sat'd | S | S | S |
| Sodium Bisulfate | Sat'd | S | S | S |
| | | Temperature | | |
| Chemical | Conc.(%) | 72 °F | 140 °F | 212 °F |
| Sodium Carbonate | Sat'd | S | S | S |
| Sodium Chlorate | Sat'd | S | S | - |
| Sodium Chloride | Sat'd | S | S | S |
| Sodium Chlorite | 20 | S | S | F |
| Sodium Cyanide | Sat'd | S | S | S |
| Sodium Dichromate[2] | Sat'd | S | S | S |
| Sodium Ferricyanide | Sat'd | S | S | S |
| Sodium Hydroxide | 50 | S | S | S |
| Sodium Hypochlorite 15% Avg. $Cl_2$ | 20 | S | S | F |
| Sodium Nitrate | Sat'd | S | S | S |
| Sulphurous Acid | Sat'd | S | S | - |
| Sulfuric Acid[2] | 98 | F | U | U |
| Sulfuric Acid[2] | 60 | S | S | P |
| Sulfuric Acid[2] | 50 | S | S | P |
| Sulfuric Acid[2] | 10 | S | S | S |
| Sulfuric Acid[2] | 2 | S | S | S |
| Tannic Acid | 10 | S | S | - |
| Tetrahydrofuran | 100 | P | P | P |
| Trichloroacetic | 10 | S | S | - |
| Triethanolamine | 100 | S | S | - |
| Trichloroethylene | 100 | P | P | P |
| Urea | Sat'd | S | S | S |
| Xylene | 100 | P | P | P |
| Zinc Chloride | Sat'd | S | S | S |
| Zinc Sulfate | Sat'd | S | S | - |

[1] Slight discoloration after 10 days

[2] In combinations of Sulfuric, Nitric and Sodium Dichromate a corrosion stress crack effect is noticed at 130° F

## Physical Properties

The normal physical properties of polypropylene sheeting are shown in the following table:

| | |
|---|---|
| Chemical characterization | Thermoplastic polymer |
| Color | Off White |
| Odor | None |
| Melting point | 165°C |
| Upper Service Temperature | 100 °C |
| Density (23°C) | 0.91g/cm$^3$ |
| Tensile Strength (N/mm$^2$) | 33 |
| Elongation at Break | 350-600% |
| Solubility in water | Insoluble |
| Explosion limits | None |
| Hardness Durometer | D 95-100 |
| Water absorption | < 0.03 |
| Flammability | HB/V-2 |
| Thermal Expansion Coefficient 23 -150°C (mm/mm/°C) | 15 x $10^{-5}$ |

## Application

The method of application is as follows:

1. The surface to be lined is properly cleaned and grit blasted to a white metal finish to provide a suitable surface for bonding. (See Electro Chemical Manufacturing Technical Bulletin #1, "Specification for Welded Steel Tanks, Stacks, Ducts or Other Fabricated Equipment for Protective Linings and/or Coatings".)

2. The Duro-Bond Polypropylene laminate is cut into panels to cover the entire area to be lined with a minimum amount of joints to be welded.

3. The panels are then cemented into position and the seams welded with with polypropylene rod and polypropylene cap strip using a thermoplastic welding gun.

Tensile strength bonds between the lining and lined surface in the range of 350 psi and peel values of up to 65 lbs. per lineal inch are obtained, per ASTM D903 @ 180$^{o}$ angle.

## Method of Testing

All lined surfaces are visually inspected for surface defects. Any special dimensional tolerances required after lining are also checked.

All lined areas are then spark tested for pinhole leaks using a dielectric spark tester adjusted to 10,000 volts. The tester is moved constantly and quickly over the lining surface to prevent a burn through.

## Repair Procedure

**Duro-Bond Polypropylene** sheet lining can be shop or field repaired. The repairs to defective or damaged areas in the sheet lining are accomplished by cutting out the faulty area, grinding or grit blasting the substrate surface, preparing a piece of sheet of the same dimension, cementing it into position and subsequently welding the joints as described under Application. The repaired area is then inspected and spark tested to insure lining integrity.

## Additional Information

For additional technical or safety information, contact us at 330-313-6372, knightmaterials.com, or info@knightmaterials.com.

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