DESCRIPTION

POLYPRO anionic and nonionic polymers are high molecular weight, water-soluble flocculating agents made by the co-polymerization of acrylamide with itself or various anionic (negatively charged) monomers. These polymers are available in both liquid emulsion and granular dry solid grades and cover the full spectrum of charges from 0 to 100%. These products have found wide applicability in municipal, industrial, pulp and paper and mining liquid-solids separation systems.

APPLICATIONS

- Influent water clarification, including potable water (TR grade)
- Filtration
- Mineral processing
- Base metal sulfide concentrate thickening
- Iron ore tailings clarification
- Coal refuse thickening and dewatering
- Bauxite/red mud
- Phosphoric acid filtration
- Copper tailings clarification
- Brine clarification
- Sand and gravel washing
- Effluent treatment
- General coagulant aid for wastewater
- Primary and secondary clarifiers, alone or in combination with organic cationic coagulants
- Primary and secondary clarifiers, in combination with aluminum, iron salts or lime
- Phosphorous removal in conjunction with inorganic coagulants
- Conditioning of metal hydroxide sludges prior to dewatering of pulp and paper mill effluent
- Textile mill wastewater
- Food processing wastewater
- Petrochemical wastewater
- Other
- Lime/soda softening
- Sugar juice clarification

DRY POLYMER SOLUTION PREPARATION

POLYPRO dry polymers cannot be fed into an application without pre-diluting in water. The recommended concentration range is 0.1-0.5% with 0.25% being optimum. Although these products are completely water soluble, certain precautions should be followed to obtain total dissolution with minimum loss of activity. Complete wetting of the individual polymer particles is the single most important factor in the preparation of dry polymer solutions. One method to achieve good wetting is to use an aspirator-type disperser that draws solid particles into a water stream using vacuum created by water pressure. A water pressure of 30 psi or greater is necessary to implement this method. The wetted polymer from the aspirator should be discharged into a vessel equipped with a high torque mixer capable of stirring the entire tank at 250-400 rpm. If the entire tank is not stirred at 400 rpm, try a lower concentration of polymer. If mixing is still inadequate, add larger impellers (or more impellers) to the mixing shaft and increase the horsepower of the mixer, if necessary. Do not increase the mixing speed beyond 400 rpm or shearing of the polymer could occur. Best practice is to mix the polymer solution at 400 rpm for 45-60 minutes or until dissolution is complete.

There are a number of commercially available automatic feed systems that use an auger to sift dry polymer into the dilution water stream. The recommended units of this type feature two separate tanks, one for mixing and one for use as a day tank for finished polymer solution. The size of the day tank should be such that the dilute polymer is consumed within 48 hours. Many applications require a concentration much lower than 0.25% polymer. In that case, it is best to add secondary dilution water through a tee and a static mixer on the way to the application.

For laboratory preparation, carefully sift 1.0 gram of dry polymer into the vortex of 400 mls of water being stirred with a mechanical mixer to prepare a 0.25% solution. Continue to mix at 250-400 rpm for 45-60 minutes or until no gels are visible.

EMULSION POLYMER SOLUTION PREPARATION

In most applications, Polypro emulsion polymers should be pre-diluted in water before use. The manual method for dilution is to slowly pour the neat polymer into the vortex of a stirred tank at ratios of 0.25-1.0% (0.5% is optimum). Make sure the mixer is large enough and has enough torque to stir the entire tank at speeds between 250-400 rpm. If the dilute polymer solution does not appear to be stirring due to high viscosity, try a lower concentration of polymer, but in no case should the concentration be reduced to below 0.25% or poor dissolution may result. If mixing is still inadequate, add larger impellers (or more impellers) to the mixing shaft and increase the horsepower of the mixer, if necessary.
Do not increase the mixing speed beyond 400 rpm or shearing of the polymer could occur. Best practice is to mix the polymer solution at 400 rpm for 10-20 minutes, shut the mixer off and allow the polymer to age for an additional 10-20 minutes. If the solution has too much undissolved emulsion, try adding the material to the vortex at a slower rate.

There are a number of commercially available automatic feed systems that provide in-line mechanical mixing. The recommended units of this type feature initial high energy mixing (>1000 rpm) for a short time (<15 sec) to achieve good dispersion of the product into water. This is followed by lower energy mixing (<400 rpm) for a longer time (10-20 min) and aging for an additional 10-20 minutes to achieve complete polymer dissolution. Best practice is to use these in-line dilution systems followed by a mixing/aging tank fitted with high/low level probes to refill the tank. The optimum concentration in the mixing/aging tank is 0.5%, and in no case should the initial concentration of the polymer be less than 0.25% for best results.

In both the manual and automatic systems, the size of the mixing/aging tank should be such that the dilute polymer is consumed within 48 hours. Many applications require a concentration much lower than 0.5% polymer. In that case, it is best to add secondary dilution water through a tee and a static mixer on the way to the application.

For laboratory preparation, inject 2.0 mls of emulsion polymer into the vortex of 400 mls of water being stirred with a mechanical mixer to prepare a 0.50% solution. Continue to mix at 250-400 rpm for 10-20 minutes. For best results, allow solutions to age for an additional 10-20 minutes before testing.

**STORAGE STABILITY**

- Dry grades as shipped: 36 months
- Solutions of dry at 0.25%: 48-72 hours
- Emulsion grades as shipped: 6 months
- Solutions of emulsions at 0.5%: 48-72 hours

Storage of dry grades should be in a cool, dry place with temperatures less than 110°F. Dry polymers are hygroscopic and can absorb humidity from the atmosphere thereby increasing the tendency to clump. Emulsion grades should not be allowed to freeze or be stored at temperatures exceeding 85°F. Should freezing occur, allow the product to thaw in a warm area and mix for several hours before using.

**FEEDPOINTS**

The selection of feed points is a critical element in maximizing the performance of flocculants in liquid/solids separation systems. Flocculants work by creating molecular bridges between microscopic particles thereby bringing them together into larger flocs. These polymer bridges are formed by relatively slow mixing and can be broken apart by excessive mixing. In general, flocculants should be added at a point in the system closer to where the actual separation is taking place to avoid shearing effects. Your Carus Corporation technical representative will survey the system to determine proper feed points for all chemicals being used.

**MATERIALS OF CONSTRUCTION**

For solutions of dry and emulsion flocculants, cross-linked polyethylene, fiberglass, stainless steel or epoxy-lined steel are the preferred materials of construction for mixing and day tanks. Unlined mild steel, black iron, galvanized steel, copper and brass are not recommended in any part of the feed system. Stainless steel, Hypalon®, Viton® and Teflon® material are the best choices for pump heads and stators. For feed lines, use PVC, stainless steel or reinforced Tygon® tubing.

**LABORATORY POLYMER SCREENING**


**PACKAGING**

This product is available in a variety of packaging sizes. Your Carus Corporation representative will recommend the appropriate packaging for the application.
IMPORTANT INFORMATION

Typical Properties: Refer to the Safety Data Sheet (SDS).

Regulatory Information: Refer to the SDS or contact your sales representative for any additional regulatory and environmental information.

Safety: An SDS is maintained for all polymer products. Use the health and safety information contained in the SDS to develop appropriate product handling procedures to protect your employees and customers.

Our SDS should be read and understood by all of your supervisory personnel and employees before using POLYPRO products in your facilities.

TABLE OF PROPERTIES - POLYPRO CATIONIC POLYMERS

I: Anionic/Nonionic POLYPRO Emulsion Polymers (milky disperse liquid)

<table>
<thead>
<tr>
<th>POLYPRO POLMER GRADE</th>
<th>ANIONIC CHARGE</th>
<th>ACTIVE CONTENT (%)</th>
<th>DENSITY (GR/ML)</th>
<th>PRODUCT VISCOSITY (CP)</th>
<th>SOLUTION VISCOSITY 0.5% IN DIST.WATER (1) (CP)</th>
<th>SOLUTION VISCOSITY 0.5% in 10% NaCl-Brine (2) (CP)</th>
<th>FREEZING POINT (°C)</th>
<th>EFFECTIVE pH RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>POLYPRO 4000</td>
<td>Norionic</td>
<td>27%</td>
<td>1.03</td>
<td>&lt;3000</td>
<td>&gt;300</td>
<td>&gt;300</td>
<td>-15</td>
<td>0-13</td>
</tr>
<tr>
<td>POLYPRO 4811</td>
<td>Low</td>
<td>30%</td>
<td>1.04</td>
<td>&lt;1700</td>
<td>&gt;6500</td>
<td>&gt;400</td>
<td>-15</td>
<td>1-13</td>
</tr>
<tr>
<td>POLYPRO 4820</td>
<td>Medium</td>
<td>32%</td>
<td>1.07</td>
<td>&lt;4500</td>
<td>&gt;5000</td>
<td>&gt;175</td>
<td>-15</td>
<td>5-13</td>
</tr>
<tr>
<td>POLYPRO 4821</td>
<td>Medium</td>
<td>36%</td>
<td>1.09</td>
<td>&lt;4000</td>
<td>&gt;4000</td>
<td>&gt;160</td>
<td>-15</td>
<td>5-13</td>
</tr>
<tr>
<td>POLYPRO 4851</td>
<td>Medium</td>
<td>31%</td>
<td>1.07</td>
<td>&lt;3100</td>
<td>&gt;8000</td>
<td>&gt;400</td>
<td>-15</td>
<td>6-13</td>
</tr>
<tr>
<td>POLYPRO 4825</td>
<td>Medium</td>
<td>31%</td>
<td>1.07</td>
<td>&lt;3100</td>
<td>&gt;7300</td>
<td>&gt;400</td>
<td>-15</td>
<td>6-13</td>
</tr>
<tr>
<td>POLYPRO 4840</td>
<td>Medium</td>
<td>40%</td>
<td>1.10</td>
<td>&lt;3800</td>
<td>&gt;6000</td>
<td>&gt;175</td>
<td>-15</td>
<td>6-13</td>
</tr>
<tr>
<td>POLYPRO 4869</td>
<td>High</td>
<td>40%</td>
<td>1.13</td>
<td>&lt;4000</td>
<td>&gt;10000</td>
<td>&gt;400</td>
<td>-15</td>
<td>6-13</td>
</tr>
</tbody>
</table>

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**II: Anionic/Nonionic POLYPRO Granular Polymers (solid grades)**

<table>
<thead>
<tr>
<th>POLYPRO POLYMER GRADE</th>
<th>CATIONIC CHARGE</th>
<th>BULK DENSITY (LB S/FT 3)</th>
<th>SOLUTION VISCOSITY % IN DIST. WATER (1) CP</th>
<th>SOLUTION VISCOSITY 1 % in 10% NaCl -BRINE</th>
<th>EFFECTIVE pH RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>POLYPRO4610</td>
<td>Low</td>
<td>42</td>
<td>&gt;2000</td>
<td>&gt;180</td>
<td>5-12</td>
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<tr>
<td>POLYPRO4630</td>
<td>Medium</td>
<td>43</td>
<td>&gt;5000</td>
<td>&gt;200</td>
<td>6-13</td>
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<tr>
<td>POLYPRO4640</td>
<td>Medium</td>
<td>44</td>
<td>&gt;4500</td>
<td>&gt;200</td>
<td>6-13</td>
</tr>
<tr>
<td>POLYPRO4645</td>
<td>Medium</td>
<td>43</td>
<td>&gt;4000</td>
<td>&gt;200</td>
<td>6-13</td>
</tr>
</tbody>
</table>

Packing: All solid grade polymers are supplied in poly-lined multi-walled bags net weight 50 lbs. (23 kg.) or polypropylene big bags net weight 1379 lbs. (625 kg.). Pallets are 25 bags (1250 lbs. net). All emulsion grade polymers are supplied in 55-gallon steel drums net weight 450 lbs. or 275-gallon semi-bulk containers net weight 2290 lbs. TR grades are NSF-approved products for use in potable water applications.