POLYANHYDRIDE RESINS

PA-18 is a solid linear polyanhydride resin derived from 1-octadecene and maleic anhydride in a 1:1 molar ratio. The long hydrocarbon side chain provides hydrophobic character to an otherwise highly polar copolymer. This property makes PA-18 and its derivatives useful in a number of applications.

APPLICATIONS

- Release agents and coatings
- Water and paper treating chemicals and coatings
- Hydrophobic clay coatings
- Corrosion preventatives
- Thickening agents
  - Epoxy curing agents
  - Chelants and surfactants
- Imparting lightfastness to basic dyestuffs
- Adhesives
- Dispersing agents

SOLUTION CHARACTERISTICS

AQUEOUS. Dilute aqueous solutions of PA-18 can be obtained with strong bases such as potassium or sodium hydroxide. The polymer becomes solvated by the base ring-opening the anhydride functionality to form a metal ester salt.

Solutions in potassium hydroxide can be prepared by slow addition of PA-18 (175 g) with rapid stirring to a 30% KOH solution (186 g) at 85 °C. Stirring at 85 °C for several hours will produce a light yellow solution with pH of approximately 12 and viscosity of less than 50 cP. No significant increase in viscosity after 30 days at room temperature or after seven days at 56 °C was observed. The salt can be recovered by the addition of water (514 mL), filtering, then precipitating the salt from the filtrate with a two-fold excess of methanol. The salt should be washed repeatedly with methanol and dried at 50 °C.

ORGANIC. PA-18 is soluble in a variety of organic solvents, such as:

- Acetone
- Carbon tetrachloride
- 1,2-dichloroethane
- Ethyl acetate
- Methyl isobutyl ketone

PA-18 is insoluble in alcohols such as ethanol and propanol, but will slowly dissolve as esterification of the anhydride occurs.

CHEMICAL PROPERTIES

- Film Formation – Clear, anhydride-functional films may be obtained by adding common plasticizers, such as phthalate esters, to organic solutions of PA-18. Films cast from an acetone solution of PA-18 plasticized with 20 w% dimethyl phthalate are smooth, glossy, and continuous.
- Reaction with Amines – The ammonium amidate derivative of PA-18 can be prepared by dropwise addition of concentrated ammonium hydroxide (143 mL) to a stirred solution of PA-18 (100 g) in THF (250 mL). Imides may be prepared by heating the half-amide.

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CHEMICAL PROPERTIES (CONTINUED)

Substituted amides may be obtained by reaction with a primary or secondary amine. Anhydrous reaction with amines and ammonia, especially in oils, results in gelation, suggesting that PA-18 could be used as a thickening agent.

- Reaction with Alcohols – Half ester derivatives of PA-18 may be formed by dropwise addition of alcohol to a stirred, acid-catalyzed solution of PA-18 in methyl isobutyl ketone under conditions such that produced water is not removed from the reaction mixture. Suitable acid catalysts include sulfuric acid, methanesulfonic acid, and p-toluenesulfonic acid. To prepare the diester, add excess alcohol and remove the water of esterification as it is formed.
- Crosslinking Reactions – The solubility characteristics and high degree of amhydride functionality make PA-18 ideal as a crosslinking agent for thermosetting resin systems containing epoxy and/or hydroxy functionality. For example, PA-18 has been shown to be an effective curing agent for epoxy resins in metal-to-metal adhesive systems. Crosslinking may be accomplished by heating the dry PA-18 copolymer with certain Group IIA metal oxides and hydroxides such as calcium oxide or calcium hydroxide.

When PA-18 is heated with a polymeric polyol such as polyvinyl alcohol, a crosslinked polyester material is formed. At temperatures above 80 °C, this crosslinked polymer flows and can be molded. Upon cooling, the material becomes crosslinked again and is insoluble in solvents such as acetone.

METHOD OF DELIVERY

PA-18 is packaged in 200-pound polyethylene-lined fiber drums. Keep packaging tightly closed and store in a clean, cool, dry place. In case of spillage, clean up and dispose of the product in accordance with the advice provided on the product MSDS.

Studies have shown PA-18 to have little or no toxic effect following ingestion. When applied to animal skin, PA-18 was not a primary irritant. The suggested exposure limit (TLV) is 10 mg/m3.

PERFORMANCE DATA

<table>
<thead>
<tr>
<th>CHARACTERISTICS</th>
<th>PA-18 LV (LOW VISCOSITY)</th>
<th>PA-18 HV (HIGH VISCOSITY)</th>
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<tbody>
<tr>
<td>CAS #</td>
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<tr>
<td>Appearance</td>
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<td>White to Yellow Powder</td>
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<td>Molecular Weight, g/mol</td>
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ADDITIONAL INFORMATION

Specification Sheets and Safety Data Sheets are available upon request and on our website at: [http://www.cpchem.com/specialtychemicals](http://www.cpchem.com/specialtychemicals)

Email us with your questions about our products at specialtychemical@cpchem.com