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sc@cpchem.com

SAFETY DATA SHEETS
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Chevron Phillips Chemical Company LP | SPECIALTY CHEMICALS

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.

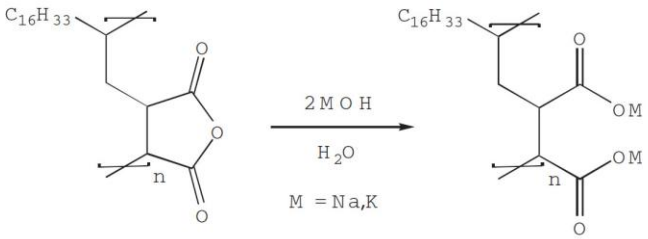
APPLICATIONS

- 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.



SOLUTION CHARACTERISTICS (CONTINUED)

To prepare aqueous sodium hydroxide solutions, the disodium salt must first be prepared by adding PA-18 (50 g) with stirring to a solution of NaOH (12.5 g) in water (387.5 g). Heating to 85 ˚C for at least an hour will form a salt suspension. The reaction may take several hours of heating at 85 ˚C before complete hydrolysis is achieved. The salt can be precipitated by adding this cooled suspension to an excess of methanol. This salt will dissolve in water with stirring and gradual heating to 80 ˚C. Clear solutions of about 10% PA-18 can be formed.

Aqueous solutions of PA-18 salts are compatible with moderate concentrations of monovalent cations; precipitation occurs with the addition of polyvalent cations. Free acids can be formed with dilute hydrochloric or sulfuric acid.

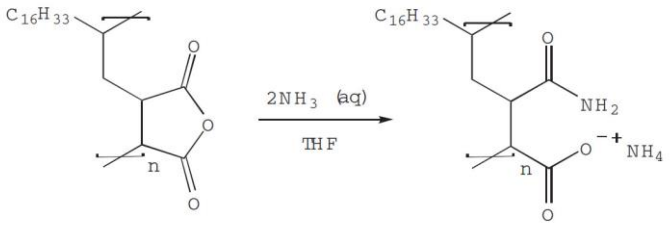
ORGANIC. PA-18 is soluble in a variety of organic solvents, such as:

- 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 wt% 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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10001 Six Pines Drive
The Woodlands, TX 77380
www.cpchem.com/specialty

U.S., Canada & Latin America: 1-800-858-4327
Europe, Africa & Middle East: +32 2 689 1211
Asia Pacific: +65 6517 3100

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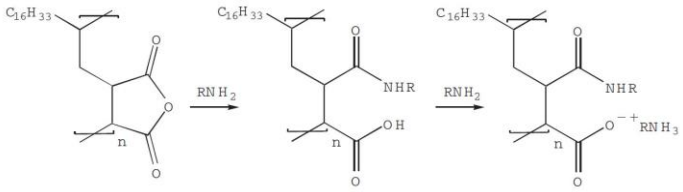
CHEMICAL PROPERTIES (CONTINUED)

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 anhydride 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

PA-18 TYPICAL VALUES

CHARACTERISTICS	PA-18 LV (LOW VISCOSITY)	PA-18 HV (HIGH VISCOSITY)
CAS #	25266-02-8	
Appearance	White to Yellow Powder	White to Yellow Powder
Melting Point, °C	110 – 135	115 – 140
Volatiles, wt %	1.0	1.5
Molecular Weight, g/mol	20,000 – 25,000	40,000 – 50,000

ADDITIONAL INFORMATION

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

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

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