SIOResin® PEI-70K Polyethylenimine

Product Overview

Polyethylenimine (PEI), also known as polyethylenimine or polyaziridine, is a highly cationic, water-soluble polymer with one of the highest cationic charge densities among organic polymers. Its basic repeating unit consists of “two carbon atoms and one nitrogen atom,” with the general molecular formula $(CH_2CH_2NH)_n$.

SIOResin® PEI-70K is a high molecular weight grade (Mw ≈ 70,000) within the SIOResin PEI product series. It appears as a colorless to pale yellow, highly viscous liquid with a mild ammonia odor. Owing to its longer molecular chains and high density of amine functionalities, PEI-70K exhibits strong cationic character, excellent bridging capability, and high adsorption efficiency, making it particularly suitable for applications requiring enhanced flocculation, retention, adhesion promotion, and interfacial bonding.

The polymer contains abundant primary, secondary, and tertiary amine groups, enabling interactions with hydroxyl, carboxyl, carbonyl, epoxy, and isocyanate groups via hydrogen bonding, ionic interaction, or covalent reaction. This structural versatility gives PEI-70K outstanding reactivity, adhesion performance, and functionality across multiple industrial systems.

Key Properties

1. **Very High Cationic Charge Density**
   PEI-70K exists in aqueous systems as a strongly cationic polymer, capable of rapidly neutralizing negatively charged surfaces such as fibers, fillers, pigments, colloids, and suspended solids. Compared with lower molecular weight grades, it provides stronger charge neutralization and electrostatic attraction, especially suitable for demanding systems.
2. **Excellent Bridging and Flocculation Efficiency**
   The high molecular weight and extended polymer chains allow PEI-70K to form effective molecular bridges between particles, fibers, or fillers. This results in larger, stronger, and more stable flocs, significantly improving retention, sedimentation, drainage, and filtration performance.
3. **High Chemical Reactivity**
   Rich in primary and secondary amine groups, PEI-70K readily reacts with epoxies, aldehydes, isocyanates, and other active functional groups. It is suitable for crosslinking modification, resin curing, functional finishing, and chemical adsorption applications.
4. **Enhanced Adhesion and Interfacial Bonding**
   Due to its high polarity and multi-functional structure, PEI-70K strongly improves adhesion to polar substrates such as metals, cellulose, inorganic fillers, and mineral surfaces, making it an effective adhesion promoter and surface treatment agent.

Physical Properties

Property	PEI-70K Specification
Molecular Weight	70,000±1000
Viscosity (mPa·s)	10000-20000
Solid Content	50%
Chroma,Hazen	≤100
Total amine value,mmol/g	10
Appearance	Colorless or light yellow liquid
pH (5% aqueous solution)	10–12
CAS No.	9002-98-6
Solubility	Completely dissolved in water, alcohol, ketone, ester and other common solvents

Applications

1. Paper and Pulp Chemicals

PEI-70K is widely used as a **high-efficiency retention aid, drainage aid, and dry-strength agent** in papermaking. Its strong cationic charge rapidly neutralizes anionic pulp fibers and fillers, while the long molecular chains provide superior bridging between fines and fillers. This leads to significantly improved retention, faster dewatering, and enhanced sheet formation. In dry-strength applications, PEI-70K forms extensive hydrogen-bonding networks with cellulose, maintaining paper strength even at high filler loading.

2. Water and Wastewater Treatment

In industrial and municipal wastewater treatment, PEI-70K functions as a **high-performance flocculant or coagulant aid**. It efficiently destabilizes colloidal systems by charge neutralization and molecular bridging, forming large, porous flocs that settle rapidly and filter easily. The amine groups also chelate heavy metal ions, making PEI-70K especially effective for treating wastewater containing metals, pigments, or fine suspended solids.

3. Coatings and Inks

In water-based coatings and inks, PEI-70K can be used as a **strong pigment anchoring agent or dispersion aid**. Its cationic amine groups adsorb firmly onto pigment surfaces, improving dispersion stability and preventing re-agglomeration under high solids or high pigment loading. Additionally, PEI-70K can enhance interfacial adhesion between pigments and binder resins, improving coating integrity and print durability.

4. Adhesion Promotion and Surface Treatment

PEI-70K serves as an effective **adhesion promoter** for metals, glass, concrete, and other polar substrates. The amine groups interact with metal oxides or inorganic surfaces, while the polymer backbone entangles or reacts

with coating or adhesive resins, forming a robust interfacial bonding layer that improves wetting, adhesion strength, and long-term durability.

5. Adhesives and Resin Modification

In adhesive and resin systems, PEI-70K can act as a **reactive crosslinker or functional modifier**. Its high amine functionality enables efficient crosslinking with epoxy and other reactive resins, increasing cohesive strength, chemical resistance, and adhesion performance. The higher molecular weight provides strong reinforcement without excessive brittleness when properly formulated.

6. Textiles, Nonwovens, and Functional Finishing

In textile and nonwoven processing, PEI-70K is used for **dye fixation, surface functionalization, and antistatic finishing**. Its strong cationic nature enhances binding with anionic dyes, improving color fastness, while its hydrophilic structure contributes to moisture management and antistatic properties. It is also applicable in functional and medical nonwoven materials.

Storage and Handling

- Recommended Storage: Cool (<25 °C), dry, sealed, and protected from light. For long-term storage, 4–10 °C is recommended.
- Hygroscopicity: PEI-70K readily absorbs moisture and CO_2; containers must be tightly sealed.
- Compatible Materials: Stainless steel, PE, PP, PVC.
- Incompatible Materials: Iron, mild steel, copper, brass (may cause discoloration or degradation).
- Handling: Avoid contamination; reseal immediately after use. For dilution, use deionized water or weakly polar solvents. Avoid strong acids or bases.

Packaging

- Packaging specifications are 4x5Kg plastic drum, 25Kg plastic drum and user specified packaging.