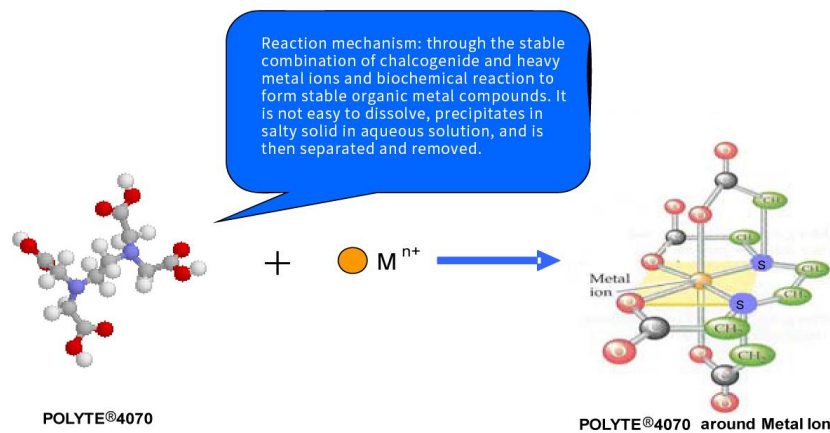


# POLYTE<sup>®</sup> 4070 Series Heavy Metal Adsorbent

## 1. Reaction Principle and Introduction



- Since POLYTE<sup>®</sup> 4070 is a stable homogeneous solution formed by rare earth metal compound and sulfur containing polymer (POLYTE<sup>®</sup> C) under certain reaction conditions. POLYTE<sup>®</sup> 4070 will continuously release organic sulfur components based on the variation of water pH in the water, released organic sulfur components react quickly with the heavy metal ions in the water and form a stable floc.

- The determination from POLYMER chemical research laboratories shows heavy metals are generated as a stable precipitate when POLYTE<sup>®</sup> 4070 encounters metal ions. The solubility product constant of the heavy metal ion and the released organic sulfur component is  $K_{sp} \leq 10^{-19}$  which is much smaller than the  $K_{sp}$  value of the hydroxide corresponding to the heavy metal. For example,

$$\text{Ni}(\text{OH})_2 K_{sp} = 2 \times 10^{-15}$$

$$\text{Ni-POLYTE}^{\text{®}} 4070 (\alpha, \beta, \gamma) K_{sp} = 3.0 \times 10^{-19} \sim 10^{-25}$$

$$\text{Cu}(\text{OH})_2 K_{sp} = 2.6 \times 10^{-19}$$

$$\text{Cu-POLYTE}^{\text{®}} 4070 (\alpha, \beta, \gamma) K_{sp} = 5.0 \times 10^{-36}$$

Above comparison shows that the solubility of the stabilized metal sulfide formed by POLYTE<sup>®</sup> 4070 is much lower than  $\text{Ni}(\text{OH})_2$  and  $\text{Cu}(\text{OH})_2$ . It well explains the chemical precipitation method used by POLYTE<sup>®</sup> 4070 is much better than the traditional precipitation treatment.

- The redox reaction occurs at first when POLYTE<sup>®</sup> 4070 encounters oxidizing metal ions, then a stable metal sulfide precipitate is formed and this metal sulfide does not reversibly react in the water.

-  $\text{H}_2\text{S}$ , S,  $\text{SO}_2$  and other decomposition products produced when POLYTE<sup>®</sup> 4070 encounters a small amount of acidic substances.

- The test showed that, POLYTE<sup>®</sup> 4070 effective applications in the field of wastewater arsenic removal in 0.5 ~ 3.0pH range.

- POLYTE<sup>®</sup> 4070 has been widely used in Europe and the United States.

## 2. Product Performance

POLYTE<sup>®</sup> 4070 is a sulfur-containing compound that is stably combined with a heavy metal ion and Sulfur family to produce a chemical reaction and form a stable and not easily dissolved organometallic compound

precipitate in aqueous solution, then can be separated and removed which is a stoichiometric reaction. POLYTE<sup>®</sup> 4070 compound formed by mercury and cadmium has the lowest solubility in heavy metal family.

Heavy Metal That React with POLYTE<sup>®</sup> 4070

IVB	VB	VIB	VII B	VIII	IB	IIB	IIIA	IV	VA	VIA
Ti	V	Cr Mo W U	Mn	Fe-Co Ni-Pd	Cu Ag Au	Zn Cd Hg	Ga In Ti	Sn Pb	As Sb Bi	Se Te

### 3. Product Features

- Powerful chelating force to effectively react with heavy metals to form insoluble substance especially mercury and cadmium.
- Able to absorb all heavy metals almost, especially in wastewater treatment, all dissolved residual heavy metals can be removed by simple treatment.
- Resulting heavy metal precipitate with good thermal stability, it is difficult to re-release of heavy metals into the environment which make POLYTE<sup>®</sup> 4070 an environmentally friendly heavy metal scavenger.
- Good toxicological and biological properties with very low toxicity.
- Good storage stability and operational safety, does not belong to dangerous goods, no bad smell, does not decompose toxic substances.

### 4. Application to Mercury Removal

The waste water produced by the wet desulfurization process of coal-fired thermal power plants contains a large amount of mercury, which combines with chloride in water to form stable soluble mercury - chlorine compound. The combination of lime and POLYTE<sup>®</sup> 4070 is used to separate mercury effectively.

The process as follows:

- Adjust wastewater pH value with lime in order to precipitate hydroxides
- Add appropriate amount of POLYTE<sup>®</sup> 4070 to precipitate heavy metal compounds
- Flocculation with inorganic coagulant or organic flocculant
- Settlement separation and filtration of precipitate
- Most of the heavy metals are first precipitated by lime, and only the remaining residues in the solution, especially mercury, are precipitated by POLYTE<sup>®</sup> 4070. It is an efficient and economical worthy adoption method.

### 5. Product Characteristic

Appearance	Clear transparent liquid	Density(25 )	1.17±0.05g/cm <sup>3</sup>
pH	12.0-14.0	Water soluble	Easy to dissolve

Applicable pH range of heavy metals that reacts to POLYTE<sup>®</sup> 4070.

Element	pH Value	Element	pH Value	Element	pH Value	Element	pH Value
Ag	2-14	Cu	2-14	Pb	2-14	Ti	2-14
As	2-6	Fe	2-9	Pd	2-9	U	2-14
Au	2-14	Hg	2-14	Sb	2-9	V	2-6
Cd	2-14	Mn	2-9	Se	2-9	W	1-2
Co	2-14	Mo	2-9	Sn	2-14	Zn	2-9
Cr	2-6	Ni	2-14	Te	2-14		

## 6. Dosing and Attention

- POLYTE<sup>®</sup> 4070 is a non-toxic and non-flammable liquid product.
- POLYTE<sup>®</sup> 4070 generally dosing through the dosing system, no metal metering box is required, easy to dosing with accurate measurement.
- POLYTE<sup>®</sup> 4070 is infinitely miscible with water
- POLYTE<sup>®</sup> 4070 cannot be mixed with acidic substances, otherwise it will lose its effect.
- Carried out on site laboratory tests to determine the optimal dosage and determining POLYTE<sup>®</sup> 4070 dosing measures under different water circumstances is recommended for POLYTE<sup>®</sup> 4070 used in industrial or public wastewater treatment.

## 7. Dosing Software

POLYMER has the special design simulation software “Calculations” for POLYTE<sup>®</sup> 4070 product dosage, which can calculate the dosage directly after inputting water quality analysis data.



## 8. Package, Storage and Transportation

Product is stored in 25kg/plastic drum. Prevent the product being subject to sunlight and rain during the transportation, pay attention to fire prevention. It should be stored in a clean, cool, ventilated and light resistant warehouse. Please refer to MSDS (Material Safety Data Sheet) or COA (Certificate of Authenticity) for the utilization of this product. Expire date: three year.

# POLYTE® 4012 Inorganic Compound Flocculant

## 1. Product Performance

This product is a composite inorganic polymer containing polynuclear iron and polyaluminum chloride ions, sulfate complex, also complex with polymerized iron on the basis of Polyaluminium chloride to increase the molecular structure, improved electrical neutralization, bridging adsorption and sedimentation performance. It is the ideal agent for treating high turbidity wastewater and low temperature high turbidity wastewater.

## 2. Product Feature

- With characteristics of high salinity, large degree of polymerization, high content of active ingredients, high floc density, fast flocculation speed, easy filtration and high water output rate.
- Effective pH range of 3.5-10, less alkalinity in consumed water and need to adjust alkalinity and pH.
- React quickly without hydrolysis, so it can get better results for low temperature wastewater.
- Dosing directly or after diluted.

## 3. Product Characteristics

Appearance	Dark brown red transparent liquid	Density(25 )	1.42±0.05g/cm <sup>3</sup>
pH	2.5-4.0	Water soluble	Easy to dissolve

## 4. Product Introduction

- Liquid product can dosing directly or diluted, and the dilution ratio is generally 5%-50% (in percentage by weight) of liquid products.
- General Dosage: 20-80ppm for liquid products, and the specific dosage is determined by the user according to the stirring test and the production test.
- Product is corrosive, the feeding equipment needs to be treated with anti-corrosion treatment and the operator needs to wear with protection equipment.

## 5. Package, Storage and Transportation

Product is stored in 25kg/plastic drum. Prevent the product being subject to sunlight and rain during the transportation, pay attention to fire prevention. It should be stored in a clean, cool, ventilated and light resistant warehouse. Please refer to MSDS (Material Safety Data Sheet) or COA (Certificate of Authenticity) for the utilization of this product. Expire date: three year.

## POLYTE<sup>®</sup> 4100 Series Anionic Polyacrylamide

### 1. Performance

Anionic polyacrylamide (abbreviated as A-PAM) is a copolymer of polyacrylamide and acrylate. Acrylic acid is introduced to make the polymer negatively charge and thus has an anionic character in aqueous solution.

### 2. Characteristics

Name	Appearance	Molecular weight (million)	Effective pH range	Density (g/cm <sup>3</sup> )	Active ingredients	Dissolution concentration
POLYTE <sup>®</sup> 4122	White particle	7-9	5-12	0.70	≥90	0.05-0.20
POLYTE <sup>®</sup> 4132	White particle	9-12	5-12	0.70	≥90	0.05-0.20
POLYTE <sup>®</sup> 4142	White particle	13-15	5-12	0.70	≥90	0.05-0.20
POLYTE <sup>®</sup> 4152	White particle	16-18	5-12	0.70	≥90	0.05-0.20
POLYTE <sup>®</sup> 4162	White particle	19-21	5-12	0.70	≥90	0.05-0.20

### 3. Wet Desulfurization Process for Wastewater Treatment of Thermal Power Plant

POLYTE<sup>®</sup> 4100 series anionic PAM is developed for the high content of suspended solids in power plant desulfurization wastewater and fine particles. The suspended solids contained in wastewater are mainly gypsum particles, calcium sulfate and calcium sulfite, as well as silica, iron and aluminum oxide. The dosing of this product lead to the agglomerate and aggregate of colloidal particles and suspended solids and produces coarse and solid floc with rapid sedimentation speed, which precipitates the sludge and improves the clarity of the supernatant. Generally, the dosage is 1.0-5.0mg/L, which is better use with the inorganic coagulant POLYTE<sup>®</sup> 4012 series. For different aqueous suspensions of suspended solids, different types of A-PAM should be used

### 4. Storage and Transportation

25Kg (3-Layer) paper bag (Lined with plastic bag), 750kg big bag (woven bag); Solid product storage time is generally one year; the dissolved flocculant has very short storage stability and generally required to use within 72 hours after open. Pay attention to moisture and rain, and prevent high temperature and exposure during storage and transportation.

# POLYTE<sup>®</sup> 4200 Series Cationic Polyacrylamide

## 1. Feature

Cationic polyacrylamide (abbreviated as C-PAM) is a copolymer of a cationic monomer and an acrylamide, and a cationic group is introduced to make the polymer positive charge in an aqueous solution.

## 2. Characteristic

Name	Appearance	Molecular weight (million)	Effective pH range	Density (g/cm <sup>3</sup> )	Active ingredients	Dissolution concentration
POLYTE <sup>®</sup> 4220	White particle	3-5	3-10	0.55-0.70	≥90	0.1-0.30
POLYTE <sup>®</sup> 4230	White particle	5-7	4-9	0.55-0.70	≥90	0.1-0.30
POLYTE <sup>®</sup> 4240	White particle	7-9	4-9	0.55-0.70	≥90	0.1-0.30
POLYTE <sup>®</sup> 4250	White particle	9-12	4-9	0.55-0.70	≥90	0.1-0.30

## 3. User Guide

POLYTE<sup>®</sup> 4200 series cationic PAM is mainly used in desulfurization wastewater of power plants and dewatering of sludge produced by sewage plants. The product neutralizes the negative charged organic colloids in sludge by its positive charged groups and has excellent bridging and coagulation functions of polymers. The excellent bridging function of the bridge causes the colloidal particles to aggregate into large floc and separate them from the suspension. The effect is great and requires less dosage. Generally, 1-10 g of POLYTE<sup>®</sup> 4200 active ingredient or 1-5kg of POLYTE<sup>®</sup> 4200 active ingredient per ton of dry mud is added per cubic wet mud. The dosage depends on the nature of the sludge. The approximate range can be determined by laboratory tests and the optimum dosage can be determined in the machine test.

## 4. Storage and Transportation

- 25kg (3-Layer) paper bag (Lined with plastic bag), 750kg big bag (woven bag).
- Solid product storage period is generally one year; the dissolved flocculant has very short storage stability and generally required to use within 48 hours after open. Pay attention to moisture and rain, and prevent high temperature and exposure during storage and transportation.