

# TRAMFLOC METAL PRECIPITANTS

## PRODUCT DESCRIPTIONS

### **Tramfloc® 901**

**Tramfloc® 901** is a proprietary formulation designed as a precipitant of heavy metals from industrial process wastewater, including metals from chelated/complexed environments. This formulation is composed of sodium dimethyl dithiocarbamate.

#### **PRINCIPAL USES**

Tramfloc® 901 has been formulated to remove heavy metals from industrial process waters including effluents of plating baths, etching solutions, and rinses containing soluble metals. Tramfloc® 901 will reduce the concentration of the following metals to acceptable levels within regulatory requirements: Ag, Au, Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Pb, and Zn.

#### **PHYSICAL DATA**

APPEARANCE:	Yellow-Green Solution
ODOR:	Amine
SPECIFIC GRAVITY:	1.10
pH	9.0-12.0

#### **HANDLING AND STORAGE**

As with any chemical, this product should be handled with reasonable care. See the Material Safety Data Sheet for complete handling information. Avoid contact with skin, eyes and clothing. Do not take internally.

#### **DOSAGE**

Bench scale jar testing will help determine the optimum dosage. Ask for our information bulletin on performing such testing. To optimize the dosage, oxidizers present in solution must be destroyed (reduced) prior to dosing Tramfloc® 901. In full-scale installations, the dosing of Tramfloc® 901 is most efficiently accomplished with an automatic feed control system.

#### **FEEDING**

Adjust the solution pH to above 8.0 prior to adding Tramfloc® 901. The metal precipitation reaction is almost instantaneous. For some applications, the addition of an iron coagulant (ferrous sulfate or ferric chloride) will help the coagulation and clarification operations.

### **Tramfloc® 902**

**Tramfloc® 902** is a proprietary formulation for the precipitation of heavy metals from wastewater. It is specifically designed for use with direct filtration equipment such as micro-filtration systems. This product gives longer filter runs and higher throughput rates than competitive products. This formulation will also reduce cleaning frequency of filters resulting in longer filter life. This product results in reduced sludge production compared to conventional practice and is also very effective with conventional clarification equipment.

#### **PRINCIPAL USES**

Tramfloc® 902 has been formulated to remove heavy metals from effluents of plating baths, etching solutions, and rinses containing soluble metals. Tramfloc® 902 will reduce the concentration of the following metals to acceptable levels: Ag, Au, Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Pb, and Zn.

## PHYSICAL DATA

APPEARANCE: Red Liquid

ODOR: Slight

SPECIFIC GRAVITY: 1.095 - 1.105

pH: 12.0 - 12.5

## HANDLING AND STORAGE

As with any chemical, this product should be handled with reasonable care. See the Material Safety Data Sheet for complete handling information. Avoid contact with skin, eyes and clothing. Do not take internally.

## DOSAGE

Your water treatment representative will make dosage recommendations depending upon your application.

## FEEDING

Adjust the pH to above 2.0 prior to adding Tramfloc® 902. Tramfloc® 902 can be fed neat or in any convenient dilution to an area of good mixing. Excellent dosage control can be achieved with a Feed Control System.

## Tramfloc® 903

Tramfloc® 903 is a liquid organic compound formulated to serve as a:

PRECIPITANT - for the removal of heavy metals from process wastewaters, ground waters, and other

polar solvents; and

DETOXIFIER-STABILIZER - for the detoxification and stabilization of heavy metals in contaminated

soils, sludges, ashes, sediments and other solids.

Tramfloc® 903 is a polythiocarbonate, an organic sulfur polymer of the basic molecular formula: CS<sub>3</sub><sup>++</sup> (CAS #128578-22-3, CAS Name: Hydropolysulfide, carbonothioylbis-,disodium salt.)

Tramfloc® 903 is essentially non-toxic.

### TRAMFLOC® 903 AS A PRECIPITATING REAGENT

As a precipitant for removing heavy metals from process wastewaters, Tramfloc® 903 reacts with metallic ions to form organo-metallic precipitates (thiocarbonates/sulfides) of extreme low solubility. The result is the near total removal of metals from waste streams - even in the presence of complexing/ chelating agents.

Tramfloc® 903 can be used over a wide pH range; that is, it is not pH dependent. Tramfloc® 903 will simultaneously precipitate ALL metals in solution and produce a stabilized by-product (sludge). Tramfloc® 903 can also be used as a “polishing” agent, after pH adjustment, to precipitate the remaining ionic metals (chelated or complexed) which will not precipitate as hydroxides during pH adjustment.

The particles formed by the Tramfloc® 903 reaction are very dense and may require coagulation to assist in their removal from solution. Tramfloc® 865A, a polyquaternary amine polymer, is recommended for this coagulation process. The high density of Tramfloc® 903 precipitate generates less sludge when compared to metallic hydroxide or carbamate sludges. The Tramfloc® 903 by-product is also extremely stable and meets TCLP stabilization requirements.

### Tramfloc® 903 AS A DETOXIFICATION/STABILIZATION REAGENT

Tramfloc® 903, upon contact with metals in contaminated soils, sludges, ash and sediment, reduces multiple valence metals to their lowest valence state, and renders all metals insoluble as stable, nontoxic, organo-

metallic complexes. They will not leach under either acidic (TCLP) or alkaline conditions. These compounds are not hazardous nor toxic and, in fact, are similar to their common metallic forms in nature, which maintain and increase their stability over time. Tramfloc® 903 is effective for both in-situ and ex-situ applications.

### TOXICITY COMPARISON

The following table compares the toxicity levels of Tramfloc® 903 to dimethyldithiocarbamate (DTC), commonly used as a precipitant. DTC is also an effective industrial microbiocide - particularly as copper carbamate, the compound formed when precipitating copper with DTC. Note that the toxicity levels of DTC are much higher than those of Tramfloc® 903.

PARAMETERS	Dithiocarbamate-40%	Tramfloc® 903
COD	440,000 mg/l	11,200 mg/l
BOD <sub>5</sub>	27,000 mg/l	4,000 mg/l
FISH TOXICITY:		
Rainbow Trout	<0.10 mg/l	33.0 mg/l
Bluegill Sunfish	<0.18 mg/l	35.0 mg/l
Brown Shrimp	1.50 mg/l	N/D
Bull Root	0.33 mg/l	N/D
ORAL LD <sub>50</sub> (rat)	2.5 gr/kg	N/D

Note: Some dithiocarbamates often contain <1% ethylene thiourea which has been determined to be a carcinogen and teratogen in laboratory animals. Most formulations also contain unreacted products of carbon disulfide and dimethylamine. Under acidic conditions, DTC will breakdown and carbon disulfide will form.

### DOSAGE

To determine the approximate dosage of Tramfloc® 903, use the following formula:

$$\text{mls Tramfloc® 903} = (\text{total ppm metal}) \times (\text{no. of gallons}) \times (Y)$$

The factor (Y) in the above formula is determined by the atomic weight of heavy metals. In a wastewater stream containing several mixed metals, the average atomic weight of the metals is used to arrive at the number 0.0401.

When calculating dosages for individual metals, (Y) is as follows:

<u>Metal</u>	<u>(Y) Factor</u>
Lead	0.0196
Cadmium	0.0362
Zinc	0.0622
Copper	0.0641
Nickel	0.0693
Mixed Metals	0.0401

When Tramfloc® 903 is used as a polishing agent, consider only those metals remaining in solution after hydroxide precipitation (via pH adjustment) for calculating the dosage per the above formula. Bench scale jar testing should be performed to determine the optimum dosage, preferably monitored by an ORP electrode. Ask for a free sample of Tramfloc® 903. To optimize the dosage of Tramfloc® 903 required,

oxidizers present in solution must be destroyed (oxidized) prior to dosing Tramfloc® 903. The type and concentration of chelators, coagulants, and other components of the wastewater may also effect the dosing criteria. In a full scale installation, dosing of Tramfloc® 903 is most efficiently accomplished with an automatic control system which includes an ORP electrode, millivolt controller and metering pump.

## **Tramfloc® 904**

Tramfloc® 904 is a proprietary formulation designed as a non-toxic precipitant of heavy metals from industrial process wastewater, including metals from chelated/complexed environments. It is a powerful replacement for commonly used toxic DTC/carbamate-type products. When compared to such products, tests show that Tramfloc® 904 has more precipitating activity at an equivalent dosage.

### **PRINCIPAL USES**

Tramfloc® 904 has been formulated to remove heavy metals from industrial process waters including effluents of plating baths, etching solutions, and rinses containing soluble metals. Tramfloc® 904 will reduce the concentration of the following metals to acceptable levels within regulatory requirements: Ag, Au, Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Pb, and Zn.

### **PHYSICAL DATA**

APPEARANCE:	Red Liquid
ODOR:	Slight
SPECIFIC GRAVITY:	1.04 – 1.05
pH	12.5

### **HANDLING AND STORAGE**

As with any chemical, this product should be handled with reasonable care. See the Material Safety Data Sheet for complete handling information about handling Tramfloc® 904. Avoid contact with skin, eyes and clothing. Do not take internally.

### **DOSAGE**

Bench scale jar testing will help determine the optimum dosage. Ask for our information bulletin on performing such testing. To optimize the dosage, oxidizers present in solution must be destroyed (reduced) prior to dosing Tramfloc® 904. In full-scale installations, the dosing of Tramfloc® 904 is most efficiently accomplished with an automatic feed control system. Your Tramfloc, Inc. distributor will make dosage recommendations to apply to your application.

### **FEEDING**

Adjust the solution pH to above 8.0 prior to adding Tramfloc® 904. The metal precipitation reaction is almost instantaneous. For some applications, the addition of an iron coagulant (ferrous sulfate or ferric chloride) will help the coagulation and clarification operations.

## **Tramfloc® 906**

Tramfloc® 906 is a proprietary formulation for the precipitation of heavy metals from wastewaters. It is specifically designed for use with direct filtration equipment such as micro-filtration systems. This product gives longer filter runs and higher through-put rates than competitive products. This formulation will also reduce cleaning frequency of filters resulting in longer filter life. This product results in reduced sludge production compared to conventional practice and is also very effective with conventional clarification equipment.

### **PRINCIPAL USES**

Tramfloc® 906 has been formulated to remove heavy metals from the effluents of plating baths, etching solutions, and rinses containing soluble metals, Tramfloc® 906 will reduce the concentration of the following metals to acceptable levels: Ag, Au, Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Pb, and Zn.

#### **PHYSICAL DATA**

APPEARANCE: Red Liquid

ODOR: Slight

SPECIFIC GRAVITY: 1.090 – 1.150

#### **HANDLING AND STORAGE**

As with any chemical, this product should be handled with reasonable care, see the Material Safety Data Sheet for complete handling information. Avoid contact with skin, eyes and clothing. Do not take internally.

#### **DOSAGE**

Your water treatment representative will make dosage recommendations depending upon your application.

#### **FEEDING**

Prior to adding Tramfloc® 906, adjust the solution pH to above 6.0. The metal precipitation reaction is almost instant. Additional coagulants are usually not required. Excellent dosage control can be achieved with an ORP Feed Control System.

## **Tramfloc® 908**

Tramfloc® 908 is a proprietary formulation designed as a precipitant of heavy metals from industrial process wastewaters, including metals from chelated/complexed environments. This formulation is composed of sodium hydropolysulfide and an iron coagulant.

#### **PRINCIPAL USES**

Tramfloc® 908 has been formulated to remove heavy metals from industrial process waters including effluents of plating baths, etching solutions, and rinses containing soluble metals. Tramfloc® 908 will reduce the concentration of the following metals to acceptable levels within regulatory requirements: Ag, Au, Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Pb, and Zn.

#### **PHYSICAL DATA**

APPEARANCE:	Black Solution
ODOR:	Slight
SPECIFIC GRAVITY:	1.30-1.37
pH	13.0-13.8

#### **HANDLING AND STORAGE**

As with any chemical, this product should be handled with reasonable care. See the Material Safety Data Sheet for complete handling information. Avoid contact with skin, eyes and clothing. Do not take internally.

#### **DOSAGE**

Bench scale jar testing will help determine the optimum dosage. Ask for our information bulletin on performing such testing. To optimize the dosage, oxidizers present in solution must be destroyed (reduced) prior to dosing Tramfloc® 908. In full-scale installations, the dosing of Tramfloc® 908 is most efficiently accomplished with an automatic feed control system.

## FEEDING

Adjust the solution pH between 6.0-9.0 prior to adding Tramfloc® 908. The metal precipitation reaction will take about 30 minutes. In some applications, iron coagulant ingredient will help the coagulation and clarification operations.

Tramfloc® 908 should be diluted to a 10% solution for feeding to the metal bearing stream.

## Tramfloc® 909

Tramfloc® 909 is a proprietary formulation designed as a non-toxic precipitant of heavy metals from industrial process wastewaters, including metals from chelated/complexed environments. It is a powerful replacement for commonly used toxic DTC/carbamate-type products. When compared to such products, tests show that Tramfloc® 909 has more precipitating activity at a similar dosage.

## PRINCIPAL USES

Tramfloc® 909 has been formulated to remove heavy metals from industrial process waters including effluents of plating baths, etching solutions, and rinses containing soluble metals. Tramfloc® 909 will reduce the concentration of the following metals to acceptable levels within regulatory requirements: Ag, Au, Cd, Co, Cu, Fe, Hg, Mn, Ni, Pb, and Zn

## PHYSICAL DATA

APPEARANCE:	Red Liquid
ODOR:	Slight
SPECIFIC GRAVITY:	1.04 – 1.05
pH	<12.5

## HANDLING AND STORAGE

As with any chemical, this product should be handled with reasonable care. See the Material Safety Data Sheet for complete handling information. Avoid contact with skin, eyes and clothing. Do not take internally.

## DOSAGE

Bench scale jar testing will help determine the optimum dosage. Ask for our information bulletin on performing such testing. To optimize the dosage, oxidizers present in solution must be destroyed (reduced) prior to dosing Tramfloc® 909. In full-scale installations, the dosing of Tramfloc® 909 is most efficiently accomplished with an automatic feed control system. Your Tramfloc representative will make dosage recommendations to apply to your application.

## FEEDING

Adjust the solution pH to above 8.0 prior to adding Tramfloc® 909. The metal precipitation reaction is almost instantaneous. For some applications, the addition of an iron coagulant (ferrous sulfate or ferric chloride) will help the coagulation and clarification operations.

## Tramfloc® 910

### PRINCIPAL USES

Tramfloc® 910 is a sulfur-based solution designed for use in treatment systems as a metal precipitating agent. Tramfloc® 910 effectively stabilizes and reduces soluble toxic metals such as Cr, Pb, As, Cd, Cu, and other metals which could be a major health risk. Geochemical fixation using a chemical such as Tramfloc® 910 converts soluble toxic metals into insoluble nontoxic compounds. The extent of metals' precipitation is a function of the pH environment. Metal hydroxides change solubility with pH changes. Metal sulfides remain insoluble within a pH range of ~5-9. Tramfloc® 910 with a pH of 10.5-11.5 typically forms sulfides

with most metals and, in the case of Cr, hydroxides. Tramfloc® 910 is particularly effective in soil washing applications.

### **TREATMENT NOTES FOR SPECIFIC METALS**

Adjustment of the pH of the treatable substrate can enhance the metals' precipitation process. **Arsenic:** Acid medium only forms various arsenic sulfides; pH > 7.0; Arsenic-Sulfur compounds are soluble; pH < 7.0; Arsenic-Sulfur compounds are soluble; **Lead:** in a pH range of 4-9, lead sulfide is formed; **Copper:** in a pH range of 5-7, copper sulfide is formed; **Zinc:** in a pH range of 4-9, zinc sulfide is formed; **Cadmium:** in a pH range of 4-9, cadmium sulfide is formed; **Molybdenum:** in a pH range of 4-9, molybdenum sulfide is formed; **Uranium:** in a pH range of 4-9, uranium sulfide is formed; **Cyanide:** Chemical conversion produces thiocyanate. It can be bio-treated or it can be treated with lime to produce calcite, gypsum and ammonia. Chromium (Cr<sup>+6</sup>) can be treated with Tramfloc® 910 to reduce the metal to Cr<sup>+3</sup> which is then precipitated as chromium hydroxide.

### **TYPICAL PROPERTIES**

Tramfloc® 910 is a 29% active sulfide solution. It forms a filterable sludge and operates well in areas where the pH of the system is > 7.0. Excess calcium precipitates as CaCO<sub>3</sub> or CaSO<sub>4</sub>. Tramfloc® 910 is easy to apply and handle in comparison to solid material which must first be dissolved prior to application.

Active Solids.....29%; Specific Gravity.....~1.27; Color.....Ruby Red; Approximate weight/gal.....10.6#; pH, neat.....10.5-11.5; pH, 300 ppm in DI water.....9.88@24<sup>0</sup> C with water pH of 7.05; pH, 300 ppm in tap water.....9.18@24<sup>0</sup> C with water pH of 7.55

### **STORAGE AND HANDLING**

Tramfloc® 910 is a water soluble liquid packaged in non returnable 55 gallon drums, 275 gallon IBC's, and in bulk tank trucks and rail cars. Store containers out of direct sunlight at moderate temperatures. Suitable materials of construction for storing and handling the solution at temperatures up to 120<sup>0</sup> F include stainless steel, polyethylene and polypropylene. Precautions should be taken to prevent inhalation, ingestion or contact with skin or eyes. Observing basic industrial hygiene precautions should prevent any health or safety hazards. Do not breathe product vapors. Dilute only in closed containers. Avoid contact with acids or acidic materials. Use in a well-ventilated area. Observe all safety precautions on label and on the Tramfloc® 910 MSDS.

## **I) Materials compatible use with Tramfloc® 910 Calcium Polysulfide Solution**

- A. Metals
  - 1) 300 Series Stainless Steels
  - 2) Cast iron
  - 3) Mild Steel
- B. Plastics
  - 1) Polypropylene
  - 2) Polyethylene
  - 3) PVC
  - 4) CPVC
- C. Seals, Gaskets, O-rings
  - 1) Viton
  - 2) EPDM
  - 3) Teflon
  - 4) Neoprene

## **II) Incompatible Materials**

- A) Copper
- B) Yellow Metals
- C) Aluminum and its alloys

### **III) Complete System Components**

- A. Storage Tanks
  - 1) Upright tank
  - 2) Conical tank
  - 3) IMFO tank
- B. Transportation Tanks
  - 1. Horizontal Tank
  - 2. Polysphere tank

Note: Locate drain fitting in a sump or lower end of a horizontal tank and the bottom of a polysphere tank to aid in complete drainage. Keep all equipment clean.

### **IV) System component materials compatible use with Tramfloc® 910**

- A. Tanks
  - 1. Cross-linked Polyethylene
  - 2. Series 300 Stainless Steels
  - 3. Mild Steel
- B. Centrifugal Pumps-Transfer Service
  - 1. Materials of Construction
    - a) Cast iron
    - b) Cross-linked Polyethylene
    - c) Series 300 Stainless Steels
  - 2. Mechanical Rotary Seals
    - a) Viton
    - b) Pressurized seal
    - c) Silicon carbide
  - 3. Seals, Gaskets, O-rings
    - a) Viton
    - b) EPDM
    - c) Teflon
    - d) Neoprene
- C. Valves, sail and butterfly
  - 1. Materials of Construction
    - a) Cast iron
    - b) Cross-linked Polyethylene
    - c) Series 300 Stainless Steels
    - d) PVC
- D. Seals, Gaskets, O-rings

- 1) Viton
- 2) EPDM
- 3) Teflon
- 4) Neoprene

- E. Hoses
- 1) Viton
  - 2) EPDM
  - 3) Teflon
  - 4) Neoprene

## **Tramfloc® 911**

Tramfloc® 911 is a proprietary formulation designed as a non-toxic precipitant of heavy metals from industrial process wastewaters, including metals from chelated/complexed environments. It is a powerful replacement for commonly used toxic DTC/carbamate-type products. When compared to such products, tests show that Tramfloc® 911 has equivalent precipitating activity at a similar dosage. Tramfloc® 911 is a blended precipitant with some coagulating properties. The coagulated particle forms slowly to form a medium/large particle.

### **PRINCIPAL USES**

Tramfloc® 911 has been formulated to remove heavy metals from industrial process waters including effluents of plating baths, etching solutions, and rinses containing soluble metals. Tramfloc® 911 will reduce the concentration of most metals, including the following, to acceptable levels within regulatory requirements: AG, AU, CD, CO, CU, FE, HG, MN, NI, PB, and ZN.

### **PHYSICAL DATA**

APPEARANCE:	Yellow Liquid
ODOR:	Slight sulfur odor
SPECIFIC GRAVITY:	1.03 – 1.04
pH	<12.5

### **HANDLING AND STORAGE**

As with any chemical, this product should be handled with reasonable care. See the Material Safety Data Sheet for complete handling information. Avoid contact with skin, eyes and clothing. Do not take internally.

### **DOSAGE**

Bench scale jar testing will help determine the optimum dosage. Ask for our information bulletin on performing such testing. To optimize the dosage, oxidizers present in solution must be destroyed (reduced) prior to dosing Tramfloc® 911. In full-scale installations, the dosing of Tramfloc® 911 is most efficiently accomplished with an automatic feed control system. Your representative will make dosage recommendations to apply to your application.

### **FEDING**

Adjust the solution pH to above 8.0 prior to adding Tramfloc® 911. The metal precipitation reaction is almost instantaneous. For some applications, the addition of an iron or aluminum coagulant will help the coagulation and clarification operations.

### **TECHNICAL ASSISTANCE**

A Tramfloc, Inc. representative is available to assist you with any water treatment problems that may arise.

## **Tramfloc® 912**

Tramfloc® 912 is a proprietary formulation designed as a non-toxic precipitant of heavy metals from industrial process wastewaters, including metals from chelated/complexed environments. It is a powerful replacement for commonly used toxic DTC/carbamate-type products. When compared to such products, tests show that Tramfloc® 912 has equivalent precipitating activity at a similar dosage. Tramfloc® 912 is a blended precipitant with some coagulating properties. The coagulated particle forms slowly to form a medium/large particle.

### PRINCIPAL USES

Tramfloc® 912 has been formulated to remove heavy metals from industrial process waters including effluents of plating baths, etching solutions, and rinses containing soluble metals. Tramfloc® 912 will reduce the concentration of most metals, including the following, to acceptable levels within regulatory requirements: AG, AU, CD, CO, CU, FE, HG, MN, NI, PB, and ZN.

### PHYSICAL DATA

APPEARANCE:	Yellow Liquid
ODOR:	Slight sulfur odor
SPECIFIC GRAVITY:	1.03 – 1.04
pH	<12.5

### HANDLING AND STORAGE

As with any chemical, this product should be handled with reasonable care. See the Material Safety Data Sheet for complete handling information. Avoid contact with skin, eyes and clothing. Do not take internally.

### DOSAGE

Bench scale jar testing will help determine the optimum dosage. Ask for our information bulletin on performing such testing. To optimize the dosage, oxidizers present in solution must be destroyed (reduced) prior to dosing Tramfloc® 912. In full-scale installations, the dosing of Tramfloc® 912 is most efficiently accomplished with an automatic feed control system. Your representative will make dosage recommendations to apply to your application.

### FEEDING

Adjust the solution pH to above 8.0 prior to adding Tramfloc® 912. The metal precipitation reaction is almost instantaneous. For some applications, the addition of an iron or aluminum coagulant will help the coagulation and clarification operations.

## Tramfloc® 913

Tramfloc® 913 is a precipitant formulated of alkali salts that can be used to remove metals in wastewater streams over a wide pH range. The greatest reduction of metals occurs in slightly alkaline wastewater, but the chemistry is designed to eliminate H<sub>2</sub>S odor even in acid solutions as low as a pH of 3.

### PRINCIPAL USES

Tramfloc® 913 is a liquid heavy metal removal product, which has a strong affinity for metal ions such as Mercury, Silver, Cadmium, Copper, Lead, Nickel, Zinc, Cobalt II, Nickel, Iron and Manganese II. This product is unique in that the structure of the product provides both metal removal as well as some coagulation of the insoluble metal particles. Applications include:

Ash Ponds	Contaminated Soils
Automotive	Electronic Manufacturing
Chemical Manufacture	Electroless Plating
Contaminated Groundwater	Flue Gas Waters

Hazardous Waste Landfills  
Hazardous Waste Treatments  
Incinerators  
Metal Fabrication  
Metal Finishing  
Metal Plating  
Military Bases

Municipal Landfills  
Nuclear Waste  
Petroleum Drilling  
Petroleum Refiners  
Printed Circuit Board Manufacturers  
Sludge Stabilization  
Waste Oil

## **DOSAGE**

Tramfloc® 913 dosage will vary depending upon the:

1. Level of metals in the water
2. Types of metals to be removed
3. Chelators present
4. Required reduction
5. Oxidizers in the water

## **COMPETITIVE COMPARISONS**

There are a number of advantages of the Tramfloc® 913 chemistry over the following competitive products:

1. DTC(Dimethyldithiocarbamate)
2. TMT
3. TTC
4. Sodium Sulfide

## **ADVANTAGES**

1. Low Hydrogen Sulfide Generation: Sulfur compounds can generate hydrogen sulfide in less than neutral pH conditions. Tramfloc® 913 is especially formulated to prevent hydrogen sulfide emissions from exceeding H<sub>2</sub>S allowable limits.
2. Mixed Wastes: Tramfloc® 913 products are effective in precipitation of mixed metal wastewater in the presence of chelating agents, surfactants and high solids waste streams.
3. Low Toxicity: Tramfloc® 913 is 10-30 times less toxic than other organic metal precipitants such as DTC compounds, and therefore less toxic to employees and the environment.
4. Wide pH Range: Tramfloc® 913 can be used over a wide pH range of 3-14 without generating harmful levels of H<sub>2</sub>S.
5. High Filterability: Tramfloc® 913 precipitates a dense particle that is easily separated and filtered.
6. Sludge Reduction: With Tramfloc® 913 a reduction in sludge generated from the removal of metals is normally quite noticeable.
7. Low Level Removal: Tramfloc® 913 removes metals to trace levels. In most cases ppb levels are achievable.

**Tramfloc® 913 will react with metals in DI water in the following order:**

<b>Element</b>	<b>Symbol</b>	<b>Tramfloc® 913</b>
Mercury	Hg	8 ppm
Silver	Ag	6 ppm
Cadmium	Cd	12 ppm
Copper	Cu	22 ppm
Lead	Pb	8 ppm
Nickel	Ni	24 ppm
Zinc	Zn	22 ppm
Cobalt II	CoII	24 ppm

Iron II	FeII	26 ppm
Manganese	MnII	26 ppm

**Tramfloc® 913 dosage needed to remove 1 ppm of metal.**

**Materials of Compatibility**

Compatible	Non-compatible
304SS	Mild Steel
316SS	Copper
Fiberglass	Brass
PVC	Galvanized
Polyethylene	Neoprene
Polypropylene	Hypalon
Teflon	

**Tramfloc® 914**

Tramfloc® 914 is an organic liquid precipitant formulated for precipitating heavy metals, particularly chelated and complexed ions, in process and other wastewaters. The precipitating reaction forms insoluble organometallic compounds with minimal sludge generation. This product contains no disulfides. This product has some coagulating properties.

**PRINCIPAL USES**

Tramfloc® 914 can be used wherever ionic metals in solution require precipitation and removal. It is particularly effective in breaking chelators and other compounds which complex metallic ions making them resistant to conventional hydroxide precipitation. To do your own bench-scale jar tests with Tramfloc® 914, ask for a free sample.

**pH CONTROL**

Although Tramfloc® 914 is non-pH dependent, precipitating reagents are most effective in the range of pH 7 to 9. Since this is the general range for acceptable discharge to sewer, adjust the pH prior to adding precipitating reagent.

**DOSAGE**

To determine the approximate dosage of Tramfloc® 914 required for treatment, use the following formula:

$$\text{(PPM Ionic Metal) X (Gallons to be treated) X (0.04257)} \\ \text{Equals } \underline{\text{Milliliters}} \text{ of Tramfloc® 914 required, } \pm 10\%.$$

NOTE: The dosage can be lowered when some of the metals are precipitated as hydroxides during pH adjustment. For example, a 1,000 gallon waste stream, after pH adjustment, containing 10 ppm Copper, 4 ppm Tin, 5 ppm Lead, and 6 ppm Nickel, has a total of 25 ppm ionic chelated or complexed metals. The dosage, using the above formula, is as follows:

$$25 \text{ X } 1,000 \text{ gallons X } (0.04257) = 1064 \text{ milliliters Tramfloc® 914.}$$

**TREATMENT NOTES**

Oxidizers in the waste stream, such as chlorine, peroxide, permanganate, persulfate, etc., will decrease the effective strength of Precipitating Reagents. Oxidizers should be eliminated from the wastewater via

Sodium Sulfite or Bisulfite. Also remove cyanide and reduce hexavalent chromium, if present, from the waste stream before the precipitation process.

Tramfloc® 914 may not be compatible with your present flocculant. This can be easily determined via test with Tramfloc flocculant samples. If not compatible, Tramfloc® 914 should be added to the waste stream separately.

In a full scale installation, Tramfloc® 914 should be dosed by means of an electronic dosing system which includes an electrode, reagent controller and metering pump. Ask for product information on such a system.

## **Tramfloc® 920**

Tramfloc® 920 is a proprietary formulation designed as a precipitant of heavy metals from industrial process wastewaters, including metals from chelated/complexed environments. This formulation is composed of sodium hydropolysulfide and an iron coagulant.

### **PRINCIPAL USES**

Tramfloc® 920 has been formulated to remove heavy metals from industrial process waters including effluents of plating baths, etching solutions, and rinses containing soluble metals. Tramfloc® 920 will reduce the concentration of metals to acceptable levels within regulatory requirements: Ag, Au, Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Pb, and Zn.

### **PHYSICAL DATA**

APPEARANCE:	Dark brown to black Solution
ODOR:	Slight
SPECIFIC GRAVITY:	1.17-1.20
pH	13.0-13.8

### **HANDLING AND STORAGE**

As with any chemical, this product should be handled with reasonable care. See the Material Safety Data Sheet for complete handling information. Avoid contact with skin, eyes and clothing. Do not take internally.

### **DOSAGE**

Bench scale jar testing will help determine the optimum dosage. Ask for our information bulletin on performing such testing. To optimize the dosage, oxidizers present in solution must be destroyed (reduced) prior to dosing Tramfloc® 920. In full-scale installations, the dosing of Tramfloc® 920 is most efficiently accomplished with an automatic feed control system.

### **FEEDING**

Adjust the solution pH between 6.0-9.0 prior to adding Tramfloc® 920. In some applications, the iron coagulant ingredient in Tramfloc® 920 will help the coagulation and clarification operations. Reaction time is about 30 minutes. Tramfloc® 920 should be fed neat to the metal bearing stream.

## **Tramfloc® 921**

Tramfloc® 921 is a proprietary formulation designed as a precipitant of heavy metals from industrial process wastewaters, including metals from chelated/complexed environments. This formulation is composed of sodium hydrosulfide.

### **PRINCIPAL USES**

Tramfloc® 921 has been formulated to remove heavy metals from industrial process waters including effluents of plating baths, etching solutions, and rinses containing soluble metals. Tramfloc® 921 will reduce the concentration of the following metals to acceptable levels within regulatory requirements:

Ag, Au, Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Pb, and Zn.

#### **PHYSICAL DATA**

APPEARANCE:	Yellow to Dark Green Solution
ODOR:	Sulfurous
SPECIFIC GRAVITY:	1.18-1.28
pH	11.5-12.6

#### **HANDLING AND STORAGE**

As with any chemical, this product should be handled with reasonable care. See the Material Safety Data Sheet for complete handling information. Avoid contact with skin, eyes and clothing. Do not take internally. You

#### **DOSAGE**

Bench scale jar testing will help determine the optimum dosage. Ask for our information bulletin on performing such testing. To optimize the dosage, oxidizers present in solution must be destroyed (reduced) prior to dosing Tramfloc® 921. In full-scale installations, the dosing of Tramfloc® 921 is most efficiently accomplished with an automatic feed control system.

#### **FEEDING**

Adjust the pH between 6.0-9.0 prior to adding Tramfloc® 921. For some applications, the iron coagulant ingredient in Tramfloc® 921 will help the coagulation and clarification operations. Reaction time is about 30 minutes. Tramfloc® 921 should be fed neat to the metal bearing stream.