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## Technical Information Bulletin
# TRAMFLOC® 903 PRECIPITANT/DETOXIFIER-STABILIZER

***Product Description***
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:
CS3++ (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. M-25, 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 .

| | Dithiocarbamate-40% | Tramfloc® 903 |
|---|---|---|
| COD | 440,000 mg/l | 11,200 mg/l |
| BOD5 | 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 LD50 (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.

***DosingTramfloc® 903***

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

mls Tramfloc® 903 = (total ppm metal) x (no. of gallons) x (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:

| Metal | (Y) Factor |
|---|---|
| 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.

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