TMT 15® - Precipitating Copper EDTA from Wastewater - Complex-conversation with iron (Fe^{3+}) in the acidic pH range -

Case Study / Info 31 E

TMT 15® is widely used in various industries that produce liquid wastes containing heavy metals. The heavy metals are usually removed from the wastewater by precipitation and flocculation.

Individual examples demonstrate the effectiveness of treatment methods in practice, and should give anyone interested enough background to perform tests to check the suitability of TMT 15® for their own particular wastewater composition. We would be happy to provide TMT 15® in sample amounts. Our Application Technology department is also prepared to provide assistance in finding solutions.

Printed circuit board manufacture / Copper-EDTA complex

Treatment process:

- Collect 1 l of rinse water from the currentless copper plating
(100 mg Cu/l, 732 mg $Na_2EDTA \times 2\ H_2O$/l, Cu: EDTA = 1:1.25 mole, pH 3),

- within 20 minutes, add 13.2 ml iron(III) chloride solution (10 g Fe^{3+}/l) while stirring,

- add 1.8 ml TMT 15®,

- adjust to pH 7 using 1.2 ml of 10% caustic soda,

- add 1 ml of 0.1% nonionic flocculation aid (such as Praestol 2500),

- stir rapidly for 1 minute, slowly for 15 minutes (pH 7),

- separate brown, coarsely flocculent precipitate by filtering

The filtrate only contained 0.34 mg Cu/l

Remarks

Consumption: 18 l TMT 15® per kg copper (Cu)
The requirement can also be determined using the calculations found at: www.tmt15.com

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pH values

To convert the copper EDTA complex with iron (III) chloride into Fe EDTA complex, it is necessary to maintain the pH between 3 and 4!

For copper precipitation, it is usually necessary to adjust the pH value to the range 7–10 after the required chemicals have been added.

Potential jumps

It was possible to indicate the end point of the complex-conversion reaction with iron (III) chloride potentiometrically, using an electrode pair consisting of a platinum / calomel electrode (see figures).

1. Potential jump Figure 1: Linking the EDTA excess with Fe^{3+}:
240 mV (from +90 mV to + 330 mV)

2. Potential jump Figure 1: Complex-conversion Cu-EDTA into Fe-EDTA:
100 mV (from +350 mV to +450 mV)

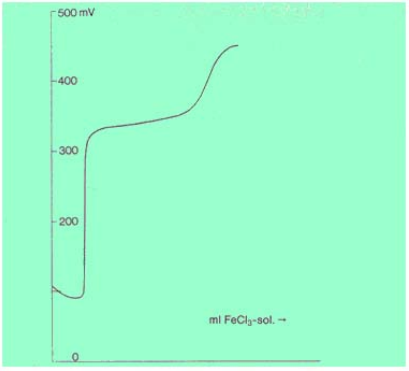

Figure 1

1. Potential jump:
   Linking the EDTA excess with Fe^{3+}
2. Potential jump:
   Complex-conversion of Cu-EDTA
   into Fe-EDTA

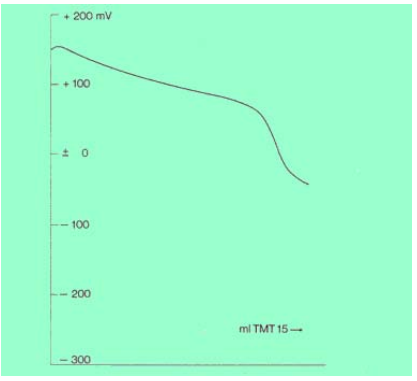

Figure 2

Precipitation of Copper withTMT 15®

Available examples

TMT Info No.	Heavy metal	Complexing agent	Branch
TMT Info 30	Copper (Cu)	Tetrammine	Printed circuit board Manufacture
TMT Info 31	Copper (Cu)	EDTA complex	Printed circuit board Manufacture
TMT Info 32	Cadmium (Cd)	Tetrammine	Electroplating
TMT Info 33	Silver (Ag)	Thiosulfate complex	Photografic rinse water
TMT Info 34	Silver (Ag)	Thiosulfate complex	Photografic concentrate
TMT Info 35	Mercury (Hg)	Chlorocomplex	Chemical industry
TMT Info 36	Nickel (Ni)	Polyamine complex	Electroplating
TMT Info 37	Lead (Pb)	Cataphoretic electro-deposition of paint	Automotive industry
TMT Info 38	Copper (Cu) & Nickel (Ni)	Actual wastewater	Printed circuit board Manufacture

Evonik would be pleased to offer its services on request for special testing of agents and materials. For further information on TMT 15®, please contact one of the addresses provided.