riag Oberflächentechnik AG · Postfach 169 · CH-9545 Wängi TG

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riag Sn 860S HS

Bright tin process based on sulphuric acid

riag Sn 860S HS is a low foaming, high speed process developed for belt conveyer systems, which can be used for decorative as well as technical applications. In addition to the usual performance characteristics of a modern tin electrolyte, it is characterised by extremely low carbon deposits and minimised whisker growth properties.

Properties

- high deposition rates
- bright deposits across a wide current density range
- excellent coat thickness distribution
- excellent solderability of coats
- technical and decorative application

Make up

	Range				Optimum	
Tin(II) sulphate	60	–	120	g/L	90	g/L
*Sulphuric acid conc.	80	–	130	g/L	105	g/L
riag Sn 860 Make up	20	–	30	mL/L	25	mL/L
riag Sn 860 Tenside	80	–	120	mL/L	100	mL/L
riag Sn 860 Antiox	1	–	2	g/L	1.5	g/L

*Sulphuric acid: figures are based on 96 % acid, for safety reasons the use of pre-diluted acid is recommended, of course the figures must then be adjusted

Make up

The tank is filled with deionised water to 60 % of the final volume. Then add sulphuric acid (it is advantageous to use a pre-diluted solution) and tin(II) sulphate carefully while stirring well (be careful, the solution gets warm). Stir until everything is dissolved. As soon as the temperature of the electrolytes has cooled down to 25° C, while stirring you add the required amount of **riag Sn 860 Make up**, **riag Sn 860 Tenside** and **riag Sn 860 Antiox** (predissolved). The electrolyte is filled up with water to the final volume. First some dummy parts are coated to work in the process.

Operating values

	Range	Optimum
Tin(II)	33 – 66 g/L	50 g/L
*Sulphuric acid conc.	80 – 130 g/L	105 g/L

Operating parameters

Temperature:	22 °C (15 – 30 °C)
Cathodic current density:	5 – 30 A/dm^2
Ratio anodes to cathodes:	minimum 1 : 1
Current efficiency:	< 100 %
Deposition rate:	at 10 A/dm^2 4 – 4.5 µm/min.
Anodes:	The purity of the tin anodes should at least be 99.99 %. We recommend the use of polypropylene anode bags.
Tanks:	Plastic or lined steel
Filtration:	For high performance electrolytes constant filtration is necessary. The electrolyte should be circulated two to three times per hour.
Heating:	Thermostatic controlled temperature regulation is essential
Cooling:	Usually required, cooling coils of acid resistant plastic or plastic coated steel- or copper tubing, respectively PTFE
Fume extraction:	Recommended
Preparation of new tanks:	New tanks should be treated with sulphuric acid ca. 5 % and **riag Sn 860 Tenside** for 24 hours**.** When a conversion of the tank from a lead containing electrolyte takes place, an alkaline primary cleaning is recommended. Our sales staff will gladly advise you.
Maintenance:	Analyse and adjust tin(II) sulphate and sulphuric acid as well as **riag Sn 860 Antiox** regularly. To increase the tin content in the electrolyte by 1 g/L, 1.8 g/L tin(II) sulphate (contains 55 % tin) is required. Dosing of **riag Sn 860 Replenisher** and **riag Sn 860 Tenside** is done according to ampere hours.
Usage:	The additives are consumed by drag out as well as electrochemical, that is by anodic or cathodic processes. Therefore the usage may vary process-related.
	riag Sn 860 Replenisher 3.0 – 5.0 L/10 kAh
	riag Sn 860 Tenside 1.5 – 2.5 L/10 kAh

General	In particular the drag-in of chloride into the tin electrolyte has to be avoided. Therefore the parts are activated with sulphuric acid (approx. 5 % V) instead of hydrochloric acid. Brass and other zinc containing alloys must not at all tin-plated directly since zinc diffuses into the tin coat. In this case a barrier coat of copper or nickel is required. **riag Sn 860 Antiox** prevents the formation of Sn (IV) and the following clouding of the electrolyte.

Environmental considerations and product safety

All concentrates, rinse waters and waste solution must be treated and discharged in accordance with local effluent control regulations. Information can be gleaned from the material safety data sheets. Chemicals shall not be stored below 10 °C.

Liability

This instruction manual was compiled with reference to the state of the art and all current standards, and is based on the long-term knowledge and experience of riag. However, riag cannot monitor compliance with this instruction manual and the methods described herein at the customer/end-user's premises. Work carried out with riag products must be adapted accordingly to meet local conditions. In particular, riag cannot accept liability for damage, loss or cost incurred due to a failure to adhere to this instruction manual, improper application of the methods, unauthorised technical modifications, insufficient maintenance or the absence of maintenance in respect of the requisite technical hardware or equipment, or in the event of use by unqualified personnel. riag is not liable for damage or loss caused by riag or its employees except where intention or gross negligence can be proved.
riag furthermore reserves the right to make changes in relation to products, methods and the instruction manual without prior notice.

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riag Oberflächentechnik AG
Murgstrasse 19a
CH-9545 Wängi
T +41 (0)52 369 70 70
F +41 (0)52 369 70 79
riag.ch
info@riag.ch

Analysis (Analytical Methods)

Sample preparation:
The sample must be taken from a well-mixed point.

Tin (II)

Reagents:	Iodine 0.05 mol/L Hydrochloric acid 37 % Starch solution 1 % Calcium carbonate p.a.	
Procedure:	5 mL	electrolyte are transferred via pipette into a
	250 mL	beaker, add
	50 mL	deion. water, add
	40 mL	hydrochloric acid 37 %, add
	approx. 2 g	calcium carbonate, add
	approx. 2 mL	starch solution
		Titrate with iodine 0.05 moL/L from colourless to dark blue. The dark blue colour has to stay for 30 s
Calculation:	Use in mL x 1.186 = g/L Tin(II)	

Sulphuric acid

Reagents:	Sodium hydroxide solution 1 mol/L Methyl red 0.2 % in ethanol	
Procedure:	5 mL	electrolyte are transferred via pipette into a
	100 mL	beaker, add
	ca. 50 mL	deion. water
	ca. 3 drops	methyl red
	Titrate with sodium hydroxide from orange-red to yellow	
Calculation:	Schwefelsäure 96 % (mL/L) = Verbrauch in mL x 5.55 Schwefelsäure 96 % (g/L) = Verbrauch in mL x 10.2	