11.02.2022

riag Sn 860S

Bright tin process based on sulphuric acid

The **riag Sn 860S** process can be used in both barrel and rack applications as well as in vibration systems. Applications include both decorative and technical purposes.

Properties

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

Make up

	Rack		Barrel / Vibration system	
	Range	Optimum	Range	Optimum
Tin(II) sulphate	27 – 45 g/L	36 g/L	13 – 27 g/L	18 g/L
*Sulphuric acid conc.	120 – 170 g/L	145 g/L	130 – 180 g/L	155 g/L
riag Sn 860 Make up	25 mL/L	25 mL/L	10 mL/L	10 mL/L
riag Sn 860 Tenside	100 mL/L	100 mL/L	100 mL/L	100 mL/L
riag Sn 860 Antiox	1.5 g/L	1.5 g/L	1.5 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

	Rack		Barrel / Vibration system	
	Range	Optimum	Range	Optimum
Tin(II)	15 – 25 g/L	20 g/L	7.5 – 15 g/L	10 g/L
*Sulphuric acid conc.	120 – 170 g/L	145 g/L	130 – 180 g/L	155 g/L

Operating parameters

Temperature:	22 °C (14 – 25 °C)
Cathodic current density:	0.5 – 5.0 A/dm^2 in rack applications 0.1 – 2.0 A/dm^2 in barrel applications
Anodic current density:	1.0 A/dm^2 (0.5 – 3.0 A/dm^2)
Current efficiency:	< 100 %
Deposit rate:	at 2 A/dm^2 approx. 1 µm/min.
Anodes:	The purity of the tin anodes should at least be 99.99 %. We recommend the use of polypropylene anode bags.
Agitation:	Electrolyte agitation by using goods movement at 2 – 5 m/min. required. The filter pump supports the movement and agitation of the electrolyte.
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. Especially important in barrel applications in order to ensure the circulation of the electrolyte.
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.

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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:	Sulphuric acid 96 % (mL/L) = Consumption in mL x 5.55 Sulphuric acid 96 % (g/L) = Consumption in mL x 10.2	