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# RIAG Cr 320

## High efficiency bright chromium electrolyte

The bright chromium process **RIAG Cr 320** is a mixed-acid chromium electrolyte. It is applied for deposition of decorative bright chromium layers. The special characteristic of this electrolyte is excellent covering power which can be obtained by operation within a wide range of current density.

**RIAG Cr 320** may be applied with 300 g/L as well as with 200 g/L chromic acid (Chromium trioxide).

High chromic acid concentrations have a positive effect to conductivity, tolerance to contaminations and there lower variations in the composition as is usual for chrome electrolytes.

### Make up quantities

	Standard make up	low concentrated make up
Chromic acid (CrO <sub>3</sub> )	300 g/L	200 g/L
Sulphuric acid, chem. pure (D = 1.84 g/mL)	0.65 mL/L	0.44 mL/L
<b>RIAG Cr 320 Additive 1</b>	25 mL/L	15 mL/L
<b>RIAG Cr 320 Additive 2</b>	30 mL/L	20 mL/L

The necessary quantity of chromic acid has to be dissolved in 70 % of the final electrolyte volume. For the make up and the current level balance deionised water is necessary. After the dissolution of the chromic acid the necessary quantities **RIAG Cr 320 Additive 1 and 2** and the sulphuric acid has to be added. Now add the deionised water until the final electrolyte volume is reached and mix well.

Afterward the electrolyte has to be worked through during 2 to 3 hours.

We recommend the application of **RIAG Cr 320 Tenside** for the reduction of atomised spray.

## Operating Conditions

Density:	300 g/L make-up = 1.21 g/cm <sup>3</sup> (abt. 25 °Be) 200 g/L make-up = 1.14 g/cm <sup>3</sup> (abt. 18 °Be)
Temperature:	35 – 50 °C, preferably 40 °C
Current density:	10 – 25 A/dm <sup>2</sup> (anode and cathode) preferably 10 A/dm <sup>2</sup>
Voltage:	The voltage is mainly depending upon the plant- and operating conditions. Average voltage: 6 – 12 V.
Anode material:	use lead alloy anodes. PbSn with 6 % Sn
Rectifiers:	Usually 8 Volt units, for higher outputs usually 12 Volt units. The rectifiers must provide a residual ripple of less than 5 % within the whole current range.
Equipment:	See instruction sheet R 20
Rate of deposition:	Rate of deposition (standard make up) at between 40 and 50 °C and cathodic current densities of: 10 A/dm <sup>2</sup> = approx. 0.08 µm/min. 15 A/dm <sup>2</sup> = approx. 0.14 µm/min. 20 A/dm <sup>2</sup> = approx. 0.22 µm/min. 25 A/dm <sup>2</sup> = approx. 0.29 µm/min.

## Maintenance

Standard make up	280 – 350 g/L CrO <sub>3</sub> The widest range of operation is achieved at a concentration of 320 – 340 g/L CrO <sub>3</sub> .
Low conc. make up	180 – 220 g/L CrO <sub>3</sub>
Sulphuric acid	0.4 – 0.6 % (in relation to the content of chromic acid) Sulphuric acid is only added after made analysis, whereat it should also be taken care that the H <sub>2</sub> SO <sub>4</sub> content between 0.4 – 0.6 % of the CrO <sub>3</sub> content is maintained (0.4 % H <sub>2</sub> SO <sub>4</sub> at lower the CrO <sub>3</sub> values, at higher ones 300 g/L the CrO <sub>3</sub> ) 0.6 % H <sub>2</sub> SO <sub>4</sub> )
Barium carbonate:	To reduce (precipitate) 1 g of sulphuric acid 2.2 g barium carbonate are necessary.

Under normal working conditions and if strictly adhering to our recommendations, corrections are required in exceptional cases only and will be prescribed by us after analysis of the solution.

## For your kind attention

Send electrolyte samples only in packages approved for transport! Fill in the tag precisely!

## Reinforcement

The electrolyte is reinforced by adding chromic acid and **RIAG Cr 320 Additive 1 and 2**. For increasing the density by 1 °Be, an addition of 1.5 kg chromic acid per 100 L solution is required. When adding chromic acid, **RIAG Cr 320 Additive 1 and 2** are added in the same ratio as the make-up.

To 100 kg chromic acid are added:  
10 L **RIAG Cr 320 Additive 1** and  
10 L **RIAG Cr 320 Additive 2**

**Attention:** Addition of other chemicals may cause trouble and may adversely affect the performance of the electrolyte and the quality of the deposits.

Pertaining to these technical Data Sheet

R1 - Working precautions for operation and plating solutions  
R20 - Technical equipment for chrome electrolyte  
R21 - Make up and maintenance of chrome electrolytes  
R22 - Anodes for chrome plating solutions

## Safety arrangements

We recommend wearing safety glasses, gloves and protective clothing during working with chromic acid.

For further information please consult the material safety data sheets.

## Waste water treatment / Environmental protection

The concentrates as well as their rinsing waters contain chromium (VI) and are extremely dangerous for waste water treatment plants. The waste water needs to be prepared according legal regulations before getting in the canalisation.

## 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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**Error index – cause and remedy**

Error	Cause	Remedy
<p><b>Lessened / no chrome deposition</b></p>	<p>No or insufficient current at the articles</p> <p>Incorrect pre-treatment</p> <p>Sulphuric acid content too high</p> <p>Strong contamination by e.g. acetate, phosphate, nitrate</p>	<p>Control power source, circuit lines, anodes, fittings and contacts</p> <p>Check pre-treatment Control mild etching</p> <p>Correct after analysis</p> <p>Control and statement by RIAG</p>
<p><b>Partly no chrome deposition</b></p>	<p>Anodes do not contact</p> <p>Development of gas pockets</p> <p>Sulphuric acid content too high</p> <p>Current density too low</p> <p>Insufficient pre-treatment</p>	<p>Check anodes and jigs</p> <p>Change position of articles on the jigs The developing hydrogen gas must have the possibility to escape</p> <p>Correct after analysis</p> <p>Adjust current density</p> <p>Control pre-treatment</p>

Error	Cause	Remedy
<p><b>Bad covering power</b></p>	<p>Temperature too high</p> <p>Sulphuric acid content too high</p> <p>Cr<sub>2</sub>O<sub>3</sub>-content too high</p> <p>Ratio anode: cathode not correct</p> <p>Current density too low</p> <p>Contamination by bivalent and trivalent metals too high</p> <p>Incorrect pre-treatment</p>	<p>Adjust temperature to 40 °C</p> <p>Adjust sulphuric acid content</p> <p>Dummy plating</p> <p>Adjust ratio of anode surface to cathode surface to 2.5 : 1</p> <p>Control current density</p> <p>Locate the cause of error</p> <p>Control pre-treatment and improve Check mild-etching (cast metal) Special covering with higher current density</p>
<p><b>Formation of nodules</b></p>	<p>Insufficient pre-treatment of the base material</p> <p>Electrolyte agitation respectively air injection</p> <p>Incorrect etching</p> <p>Sulphuric acid content too low</p>	<p>Control mechanical pre-treatment</p> <p>Try to avoid electrolyte agitation</p> <p>Check etching solutions, analyse and correct Control etch conditions e.g. vary current density and etching times</p> <p>Adjust sulphuric acid content to nominal values</p>

Error	Cause	Remedy
<p><b>Burnings</b></p>	<p>Temperature too low</p> <p>Current density too high</p> <p>Incorrect shielding</p> <p>Chromic acid content too low</p> <p>Chloride contaminations</p>	<p>Adjust temperature to 40 °C</p> <p>Control current density</p> <p>Control shielding and improve if necessary</p> <p>Analyse and correct</p> <p>Analysis, locate the source of the chloride contamination Apply chlorine- and chloride-free water for topping up Add a silver anode</p>
<p><b>Desired coating thickness is not obtained</b></p>	<p>Current density too low</p> <p>Treatment time too short</p> <p>Depositions on tracks and shielding</p> <p>Residual ripple of rectifier e.g. too high</p> <p>Incorrect composition of electrolyte, e.g. CrO<sub>3</sub>-content too high or too low or sulphuric acid content too high</p>	<p>Control calculation for current density Check ammeter and apparatus for thickness measuring</p> <p>Check treatment time</p> <p>Control racks</p> <p>Control rectifier</p> <p>Analytical control and correction</p>

Error	Cause	Remedy
<b>Dull, milky deposits</b>	Temperature too high  Content of <b>RIAG Cr 320 Additive 1</b> to high  Impurity of phosphate  Plating time to long	Adjust temperature to 40 °C  Dilute or add chromic acid  Send sample to RIAG  Reduce plating time
<b>Blue to greyish milky deposits</b>	Impurity of nitrates	Dummy plating with high current density