

CHROMIUM DEPOSITION FROM TRIVALENT ELECTROLYTES

- WASTEWATER TREATMENT WITHOUT PROBLEMS –



Figure 1: Sample part coated with the Saphir 2000 BL.

In the decorative as well as functional area of electroplating, chrome layers play a decisive role. The bright, shiny and hard layer has a high value in the fittings, furniture and automotive industries. Replacing hexavalent chromium baths with trivalent electrolytes often results in the problem

that the layers are optically different from each other and therefore mixed plating is not possible. The SAPHIR 2000 BL process from KIESOW OBERFLÄCHENCHEMIE GmbH & Co. KG is a modified trivalent chromium process which enables depositions with b^* values in the negative range (-0.5 to -1). It has been specially developed for the automotive industry (Fig. 1).

SAPHIR 2000 BL has been on the market for about a year and has proven to be a reliable and robust trivalent chromium process. It is characterized by the fact that it works resiliently and reliably and layer thicknesses of up to $0.3 \mu\text{m}$ can be achieved.

A major advantage, with a unique selling point on the market, is the simple wastewater treatment.

The SAPHIR 2000 BL electrolyte does not contain any complexing agents and can therefore be disposed of by means of simple neutralization treatment in a standard chemical-physical wastewater treatment plant. The limit value for chromium (total) for wastewater according to Annex 40 AbwV is 0.5 mg/l and can therefore be safely and easily complied with.

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In contrast to electrolytes with strong complexing agents and correspondingly high requirements for complex treatment, the simple handling of the wastewater from SAPHIR 2000 BL processes could also be confirmed by the team of bi.bra Abwassertechnik GmbH (www.bi-bra.de). In the tests carried out, the electrolyte (4 g/l Cr) was diluted to different degrees (1:40, 1:20 and 1:10) in order to be able to carry out a neutralization precipitation afterwards (Tab. 1).

Table 1: Neutralization precipitation of the dilutions was carried out as follows.

Step	Action	Set-Value	Chemicals	remarks
1	acidify	pH 1,5	HCl	
2	reaction time	30 min		
3	neutralization	pH 9,5	Ca(OH) ₂	
4	reaction time	60 min.		
5	flocculation		bi.bra Floc-MK	
6	filtration			fluted filter
7	analysis filtrate			

All samples were then passed separately through a folded filter and the clear filtrate was collected (Fig. 3). The analysis of the clear filtrate was carried out according to DIN EN ISO 11885; 09-2009. It was found that the Cr concentration in the wastewater was below 0.3 mg/l Cr for all samples and thus the discharge conditions were fulfilled. The laboratory report on the results can also be viewed on our homepage (link to be inserted).

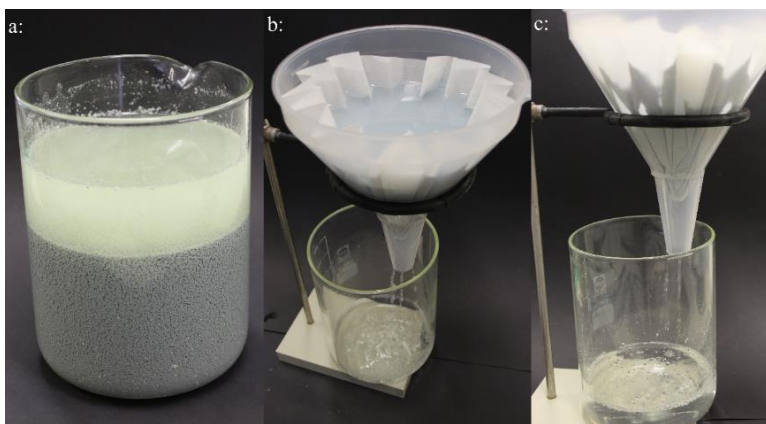


Figure 2: Precipitation of the chromium hydroxide after addition of the milk of lime (a); filtration of the solution to separate the chromium hydroxide from the clear phase (b); collection of the clear phase for analysis (c).

In production operations, the use of an ion exchange system for bath maintenance is necessary in order to safely remove foreign metals such as Cu, Ni, Fe, Zn from the electrolyte by means of special ion exchange resin, depending on the upstream processes. Depending on the production volume, this treatment plant can be designed with one or two lines or with manual or automatic control.

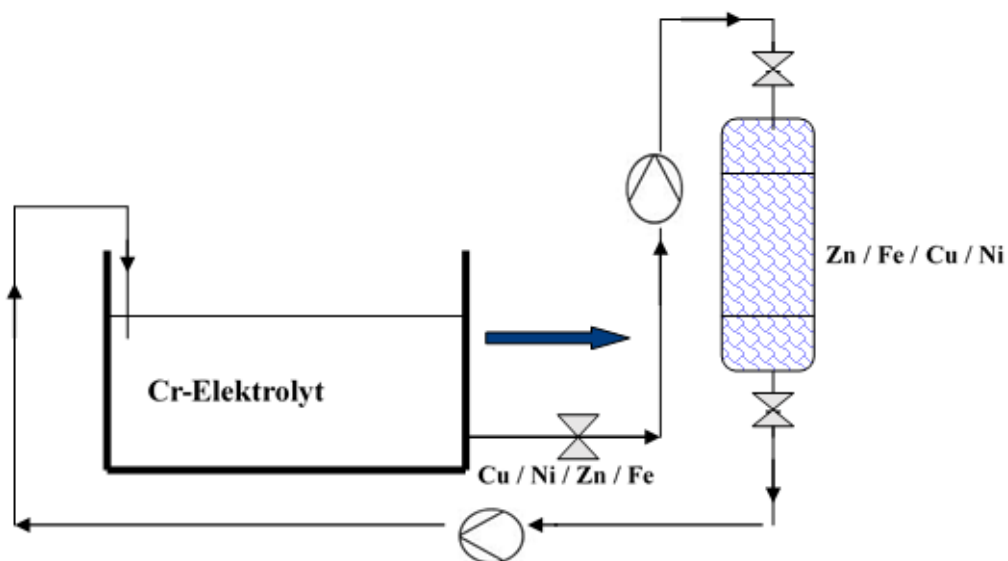


Figure 3: Schematic representation of the chromium system with connected ion exchanger system.

Overall, the depositions of the SAPHIR 2000 BL electrolyte are comparable to those from hexavalent systems, and the wastewater treatment does not cause any difficulties. It is a user-friendly electrolyte that fully meets the demands of a decorative chrome coating.

We would welcome the opportunity to introduce you to the SAPHIR 2000 BL electrolyte. Our technical field service will be pleased to advise you during the introduction phase of the SAPHIR 2000 BL process.

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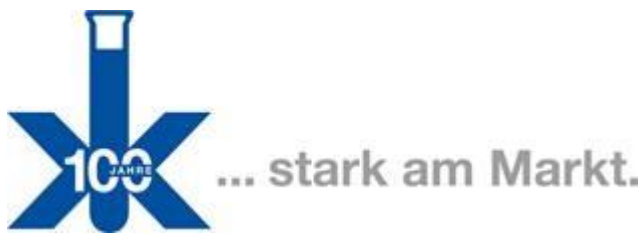
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Lab Report bi-bra Abwassertechnik





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Lab Report

Datum 08.06.2022
 Nummer S000008
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date: March, 23rd 2022
project-ID: Internal
date of analysis: March, 23rd 2022
laboratory technician: Mr. Malk Fuhrmann

task: Treatment of rinsing water from trivalent chrome processes with varying concentrations. Base electrolyte: Kiesow Saphir BL2000

base sample: electrolyte: Kiesow Saphir BL2000
 c(Cr-III): ≈ 4 g/l

experimental setup : The electrolyte was diluted for the experimental setup. The dilutions are 1:40 (0.078 g/l), 1:20 (0.13 g/l) and 1:10 (0.24 g/l). A neutralization precipitation was then carried out with the dilutions.

process sequence:

step	action	set-value	chemicals	remarks
1	acidify	pH 1,5	HCl	
2	reaction time	30 min		
3	neutralisation	pH 9,5	Ca(OH) ₂	
4	reaction time	60 min		
5	flocculation		floc. additive	
6	filtration			fluted filter
7	analysis filtrate			

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treatment:

sample	1	2	3
initial concentration Cr (mg/l)	78	130	240
pH-value	3,6	3,5	3,2
flocculation	very good	very good	very good
colouration	clear	clear	clear
concentration Cr (mg/l) filtrate	0,21	0,21	0,24

evaluation:

All tests show a very good result.

Neutralization precipitation is possible with $\text{Ca}(\text{OH})_2$ up to an initial Cr concentration of 0.3 g/l without restrictions.

A precipitation below the required limit value for chromium (total) of 0.5 mg/l is certainly possible (AbwV - Appendix 40 - German Water Act).

There were no problems with filtration.

conclusion:

The Kiesow Saphir BL2000 can be treated without any problems with a simple neutralization precipitation.

