Passivation mechanism

Cr^0 passivated

→ noble/positive potential

Component kept cathodic

→ negative polarisation

Potential displacement towards the negative

→ concentration of $Cr^{2+/3+}$ ions in the Helmholtz double layer

Reactions with anions from the solution

→ formation of a thicker passivation layer

Result: higher corrosion resistance

Chromium layers are passivated by the presence of a mixture of air and oxygen. The potential of the layers of chromium is hence displaced into the positive range – the surface hence becomes nobler. This is the basis of the corrosion mechanism for Cu-Ni-Cr and Ni-Cr layers.

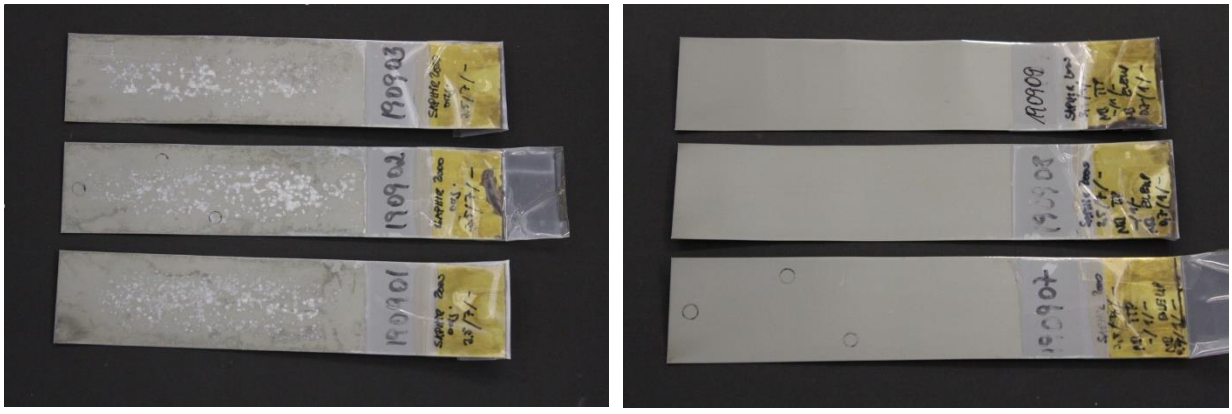
The hexavalent chromium layer deposited considered separately, is passivated additionally in the chromium plating electrolyte consisting of chromic acid anhydride. The hexavalent chromium plating is deposition from the acid form, whereas trivalent chromium plating is carried out from the salt form. Here this type of passivation is missing! That is why it is necessary to form a protective film or a corrosion-inhibiting conversion layer. In the following diagram you can see the progressive formation of the passivation layer with SAPHIR 2000 EPT:

1) The component kept cathodic with the trivalent deposited chromium layer experiences negative polarization.
2) The positive (noble) potential is displaced towards the negative. In this case despite the component being kept cathodic an increase in concentration of Cr^{2+}- and Cr^{3+}ions in the Helmholtz double layer is obtained.
3) In this film a reaction occurs with different anions from the solution. From the reaction with the cations and the anions in the cathode film a thicker passivation layer is formed.
4) The result is a higher corrosion resistance of the passivated chromium(III) layer.

The SAPHIR 2000 EPT works at current densities of 2 - 3 A/dm^2 and exposure times of 2 - 4 minutes. Pb/Sn material is used as an electrode,. The product SAPHIR 2000 EPT is free of complexing agents and contains no chromium compounds. At the same time all of the ingredients are analysable. In order to achieve corrosion resistances meeting the requirements of the automotive industry for exterior parts a two-stage passivation system must be used.

1. Chemical passivation
2. Electrolytic passivation with SAPHIR 2000 EPT

Corrosion test results have shown that an increase in the treatment time negatively influences the corrosion current and that consequently the layers show a higher resistance.



Trivalent chromium plated sample panels after corrosion test DIN EN 248 without (on the left) and with (on the right) SAPHIR 2000 EPT

Samples after 96 h CASS test

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