Dark-Coloured, Decorative Precious Metal Coatings with New Properties

A newly developed electrolyte allows dark precious metal coatings to be produced that are highly resistant to abrasion. The process is very cost-effective, which opens up a wide range of new applications for decorative finishes.

The process of creating dark precious metal surfaces for decorative purposes has long been considered one of the toughest challenges in the world of electroplating. Developing an electrolyte that can produce an affordable dark-coloured coating with a high level of wear resistance has proved to be very difficult. This is hardly surprising, because dark precious metal finishes are considered to have significant potential, in particular in the jewellery industry. Umicore Electroplating has now created an electrolyte (Rhoduna-Alloy Black 1) that fills this gap in the market.

Only a few metals are currently suitable candidates for the deposition of a dark precious metal coating. The metal most frequently used is ruthenium, which, because of its low level of abrasion resistance and often brownish colour, is not ideal for everyday items. Rhodium is also an option, but its high cost precludes its use on mass-produced products for the majority of manufacturers.

Umicore Electroplating specialises in the development of alloy electrolytes and has created an electrolyte consisting of equal quantities of ruthenium and rhodium, with the aim of eliminating the negative properties of both types of coating.

Elegant anthracite instead of jet black

Measurements made with a spectrophotometer (the L*a*b* colour space) confirm that Rhoduna-Alloy Black 1 creates a high-quality anthracite-coloured finish. This is due to the low a* and b* values (colour values) of 0.6 on average in the L*a*b* colour space. When current densities of above 1 A/dm² are used to deposit the coating, no colour faults can be seen. Many pure rhodium and pure ruthenium finishes have problems in particular with the b* value. It is almost impossible to achieve figures lower than three and the result is that colour faults (yellow or brownish discolouration) are clearly visible.

With an L* value (brightness) of 65, the coating is an appealing shade of grey, which is familiar from the widely used black pure rhodium coatings. Another indication of the high quality of the coating is the consistency of the figure, regardless of the current density used in combination with the electrolyte. The maximum deviation of 0.6 on the neutral grey axis demonstrates that the colour shifts in the brightness are not visible to the human eye.

The jewellery industry in particular requires high levels of abrasion resistance from its decorative surfaces. Rhoduna-Alloy Black 1 produces results that are around four times better than pure black rhodium or ruthenium coatings with a similar L* value. When a layer 0.2 µm thick is removed (measured using the Bosch-Weinmann method), it is comparable with light-coloured resistant coatings such as Rhoduna-Alloy 1.

Lower manufacturing costs open up a wide range of applications

As a result of the high proportion of relatively inexpensive ruthenium, the price of the coating is around 45% lower than pure rhodium products. This makes the new electrolyte attractive from a cost perspective to manufacturers that are currently using black rhodium or have avoided dark precious metal finishes altogether. Because the coating has good wear resistance properties, it is ideal for a wide range of applications, including plug contacts, pens, bathroom fittings and car interiors. //

(Jewellery) manufacturers that are currently using black rhodium or have avoided dark precious metal finishes altogether will find the new electrolyte attractive from a cost perspective.

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