ABSTRACT: An aqueous electrolytic-stripping bath to remove nickel, chromium, or gold coatings from copper, copper alloy, silver, zinc, or titanium metal articles comprising ammonium thiocyanate as the stripping component and a phenol to accelerate the stripping and to reduce corrosion of the base metal.
The present invention relates to a novel electrolytic-stripping bath for the detachment of galvanic deposits of chromium, nickel or gold from base metal bodies made of copper and copper alloys, silver, zinc, or titanium, the main stripping component of the bath consisting of an aqueous solution of a water-soluble salt of thiocyanic acid, preferably a solution of ammonium thiocyanate, in the presence of a water-soluble phenol. Preferably, the water-soluble phenol is selected from the group consisting of phenol, pyrocatechol, resorcinol, hydroquinone, pyrogallol, phloroglucinol, oxyhydroquinone, nitrophenol, dinitrophenol, nitropyrocatechol, cresol, nitrocresol, thymol, nitrothymol, xyleneol and nitroxylenol.

The amount of phenol which is employed is less than the amount of ammonium thiocyanate. Without the phenol, the electrolytic stripping is inefficient because the base metal is pitted and corroded by the electrolytic-stripping solution.

During the galvanic coatings of metal objects made from copper, silver, zinc or titanium, such as the heads of headlight armatures, etc., the defective coatings which are ascertained by inspection must be removed and it is necessary to strip these defective coatings before the objects can again be coated galvanically. The mechanical removal of defective coatings by brushing or sandblasting requires a substantial work expenditure, skilled workmen and high costs; and, in the case of objects which have a complicated structure, the mechanical removal cannot be carried out at all.

It is known to strip copper, silver, zinc or titanium objects of their defective coatings of the above-mentioned types by dipping them into a suitable chemical bath, e.g., a strong mineral acid. However, such chemical baths require long stripping times and these chemicals dissolving processes are uneconomical. It is also known to detach these defective coatings electrolytically in strong sulfuric acid but, in this case, the base material is substantially attacked and the stripping time is much too long.

In accordance with the present invention, the defective coatings of the above-mentioned types can be detached more effectively and more rapidly by the electrolytic method, whereby the object that is to be treated is dipped into a galvanic bath as the anode and the bath is adjusted with a pitting preventative agent consisting of a water-soluble phenol which is present in an amount less than the dry weight of the thiocyanate salt.

When working with such a galvanic bath consisting of an aqueous solution of ammonium thiocyanate without a phenol, various weaknesses of the stripping operation will appear; namely, (1) the protective layer which is formed is not uniform and homogeneous on the base material so that pitting occurs and (2) semiglossy and dull-finish nickel layers are stripped very slowly.

The present invention thus provides a galvanic bath for the electrolytic detachment of galvanic coatings of chromium, nickel, or gold from base bodies of copper, copper alloys, silver, zinc or titanium which overcomes the disadvantages of the known thiocyanate salt baths.

A large number of practical tests which have been carried out by the inventor have shown that the addition of a water-soluble phenol or a homologue of the phenol increases the speed of stripping and reduces the stripping time of the defective coatings of nickel, chromium and gold and especially reduces the stripping time of nickel, chromium and gold, the present invention also provides the advantage that a water-repellent layer permeable to the stripping current is formed on the base material consisting of copper, copper alloys, silver, zinc or titanium during the stripping process and this layer permits corrosion of the base metal. The protective layer can be removed later on by dipping the base body into a diluted caustic soda solution.

It is preferred to use phenol which is nitrophenol or nitroxylenol as the additive to the bath since these phenols have good solubility and are of relatively low cost. For this purpose of the invention, one can also use multivalent phenols and/or multivalent nitrophenols as an additive to the bath. For example, one can use dihydroxybenzenes (pyrocatechol, resorcinol, hydroquinone, resorcinol, pyrogallol, phloroglucinol, oxyhydroquinolone) or their nitro compounds, especially nitropyrocatechol with ammonium nitrate, as anodic additives. Similarly, the bath is preferred to use water-soluble aromatic hydroxy compounds with at least one unsubstituted hydroxy group in the benzene ring.

In practice, those baths have proven to be particularly suitable which contain 5 to 30 grams of ammonium thiocyanate and 5 to 80 grams of a phenol, such as nitroxylenol, per liter of liquid bath.

According to the present invention, one operates with the bath as follows:

The base body made of copper, copper alloys, silver, zinc or titanium, which is to be freed of its metallic coating, is dipped into the bath and connected as an anode. A stainless steel mesh sheet can be used as cathode. As a minimum amperage, 8 ampere/dm² is provided. One operates in a temperature range of 20°C to 60°C. The pH value of the bath lies between 6.5 and 7.5 and does not need to be regulated by the addition of any buffers or other acidity regulating chemicals.

The invention is described in the following preferred example which represents an illustrative embodiment with which excellent practical success has been achieved.

**EXAMPLE**

A solution consisting of 75 g. of ammonium thiocyanate and 50 g. of phenol per liter of water was produced. A base body made of copper, which had a semiglossy nickel coating of a thickness of 0.025 mm. was immersed in the solution, which represented the galvanic bath in a corrosion resistant, plastic vat. The temperature of the bath was maintained at 35°C. The base body was connected as anode and a metal plate made of stainless steel was used as cathode. At a current density of 10 ampere/dm², was produced and the nickel coating was completely detached from the base body in about 5 minutes, whereby the base body was left smooth and in such condition that it could be provided with a galvanic coating without having first to be polished again.

I claim:
1. An aqueous electrolytic stripping bath to remove nickel, chromium, or gold coatings from copper, copper alloys, silver, zinc or titanium metal articles comprising water-soluble thiocyanate as the stripping component in an amount of 50–300 grams per liter and a phenol which is a water-soluble aromatic hydroxy compound with at least one unsubstituted hydroxy group in the benzene ring to accelerate the stripping and reduce corrosion of the base metal in an amount of 5–50 grams per liter.
2. A bath as claimed in claim 1 wherein said phenol is selected from the group consisting of phenol, pyrocatechol, resorcinol, hydroquinone, pyrogallol, phloroglucinol, oxyhydroquinone, nitrophenol, nitroxylenol, nitrophenol, nitropyrocatechol, cresol, nitrocresol, thymol, nitrothymol, xyleneol and nitroxylenol.
3. A stripping bath as claimed in claim 1, wherein said phenol is cresol.
4. A stripping bath as claimed in claim 1, wherein said phenol is thymol.
5. A stripping bath as claimed in claim 1, wherein said phenol is xyleneol.
6. A stripping bath as claimed in claim 1, wherein said phenol is nitroxylenol.
7. A stripping bath as claimed in claim 1, wherein said phenol is nitrothymol.

8. A stripping bath as claimed in claim 1, wherein said phenol is nitroxylenol.

9. A stripping bath as claimed in claim 1, wherein said phenol is nitrophenol.

10. In the stripping of coatings of nickel, chromium or gold from articles made of copper, copper alloys, silver, zinc, or titanium, the process which comprises inserting the coated article in a stripping bath and passing electric current from said article serving as anode to a cathode, said stripping bath consisting essentially of an aqueous solution of ammonium thiocyanate as the stripping component in an amount of 50–300 grams per liter and a phenol to accelerate the stripping and reduce corrosion of the base metal in an amount of 5–80 grams per liter.