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STRIPPING PROCESS FOR PLUTONIUM

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This invention is related to a method of cleaning a metal, and more particularly to a method of cleaning plutonium.

Due to the known radioactive properties of plutonium and to the possibility that it may evolve radioactive or toxic fumes, it is desirable to cover the plutonium with a protective coating. In the past, metals such as silver, nickel, cadmium, zinc, indium and the like have frequently been used for such a coating. At times it is necessary to remove this protective coating either because the coating is defective or because it is necessary to rework the plutonium. Prior to the time of this invention this removal has proved to be a very expensive process because the methods used for removing the coating such as dissolving it in chemical compounds also removed some of the very valuable plutonium.

It is, therefore, the primary object of this invention to provide a method for efficiently and rapidly removing metal coatings from plutonium.

It is a further object of this invention to provide a method for removing metal coatings from plutonium objects while at the same time leaving the plutonium objects intact.

It is a still further object of this invention to provide a process for removing metal coating from plutonium metal bodies efficiently and rapidly while at the same time rendering the surface of the plutonium metal bodies passive.

The objects of this invention are achieved by the process of removing the protective metal coatings from plutonium by immersing the coated plutonium object as the anode in an electrolyte in which plutonium is passive and the coating metal is not passive, using a metal as cathode which does not dissolve rapidly in the electrolyte and passing an electrical current until the coating metal is removed from the said plutonium body.

More specifically, the plutonium body is used as the anode, and metals such as stainless steel are used as the cathode, in an electrolyte such as concentrated sulfuric acid or phosphate ion solutions.

The methods of this invention can best be illustrated by the following examples which are given for the purpose of presenting embodiments thereof and not for the purpose of limiting the spirit or scope of the invention. Example I presents the presently preferred embodiment of the method of this invention.

Example I

A piece of plutonium foil 1.6 inches square and 0.1 inch thick with a silver coating 1 mil thick on each surface is immersed in 98 percent sulfuric acid which has a specific gravity of 1.84. The plutonium is used as the anode, a stainless steel block of the same size is used as the cathode. The container is of Pyrex glass and is left at room temperature. An anode current density of 0.5 ampere per square inch is applied until the coating is substantially dissolved. At this time the current ceases to flow because the plutonium is not soluble in the electrolyte used. This requires from 3 to 5 minutes and leaves the surface bright, lustrous but passive.

Another embodiment of the method of this invention is illustrated in Example II in which the phosphate ions are supplied by trisodium phosphate.

Example II

A piece of plutonium 2.0 inches square and 0.1 inch thick with a 1 mil nickel coating on each surface is placed in an aqueous solution containing 100 grams of trisodium phosphate per liter of water. The vessel is Pyrex glass and the bath is maintained at room temperature. The plutonium block is used as the anode, and a similar size stainless steel block is used as the cathode. An anode current density of 0.4 amperes per square inch is applied. After about 5 minutes the coating is removed, the surface of the pure plutonium is rendered passive and the current ceases to flow.

The method can, of course, be varied in many ways. For example, the container may be any material such as Pyrex glass or stainless steel which is not appreciably dissolved in the electrolyte. The cathode, likewise, may be any metal such as the stainless steel used in the above example, which does not appreciably dissolve in the electrolyte. The current density may be varied depending on the depth and nature of the coating. As an example, the current density may be varied from 0.1 to 1 ampere per square inch in order to quickly and efficiently remove a 1 to 5 mil silver deposit from the plutonium.

The method of the invention can be applied to removing types of metal other than silver or nickel. For example, the process can be applied to the removal of metal coatings such as cadmium, zinc, indium, and the like.

The method has the advantage of high current efficiency. The rate of cleaning is easy to regulate within wide limits through simple current manipulations. It has the additional advantage pointed out hereinbefore that as soon as the plating is substantially removed, the current flow stops since plutonium is rendered passive and is not soluble in the electrolyte.

Because of the many possible variations it is to be understood that the invention is not to be limited in spirit or scope except as indicated in the appended claims.

What is claimed is:

1. The method of stripping metal coatings from plutonium metal bodies, said metal coating being selected from the class consisting of silver, nickel, cadmium, zinc and indium, which comprises immersing the plutonium metal body as anode and a stainless steel body as cathode in an electrolyte essentially of an aqueous solution of trisodium phosphate, and passing an electrical current at an anode current density of from 0.1 to 1.0 ampere per square inch until the coating metal is removed.

2. The method of stripping metal coatings from plutonium metal bodies, said metal coating being selected from the class consisting of silver, nickel, cadmium, zinc and indium, which comprises immersing the plutonium metal body as anode and a stainless steel body as cathode in an electrolyte essentially of an aqueous solution of trisodium phosphate, and passing an electrical current at an anode current density of 0.5 ampere per square inch until the coating metal is removed.

3. The method of stripping metal coatings from plutonium metal bodies, said metal coating being selected from the class consisting of silver, nickel, cadmium, zinc and indium, which comprises immersing the plutonium metal body as anode and a stainless steel body as cathode in an electrolyte consisting essentially of 100 grams per liter of trisodium phosphate in an aqueous solution, and passing an electrical current at an anode current

density of 0.5 ampere per square inch until the coating metal is removed.

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