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2,756,489

METAL ALLOY

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The present invention is concerned with uranium base alloys and more particularly relates to uranium base alloys containing chromium.

Uranium is not resistant to corrosion, therefore one object of the present invention is to so improve the physical properties of uranium and uranium-rich alloys as to enhance the corrosion resistance thereof and render the same useful for various purposes for which uranium and previously available uranium-rich alloys have not been satisfactory or effective.

Still another object of this invention is to produce uranium-chromium alloys which are useful as fuel elements in neutronic reactors, such as those disclosed in U. S. Patent No. 2,708,656 to Fermi et al.

Other objects of the present invention will be apparent from the following description, taken in connection with the appended claims.

In accordance with the present invention it has been found that the corrosion resistance of uranium and uranium-rich alloys may be substantially improved by incorporation of a quantity of chromium in such uranium or uranium alloy. The amount of chromium which may be added is capable of some variation. However, several percent of chromium by weight, based upon the weight of the uranium, very materially improves the corrosion resistance of the uranium product and the corrosion resistance of the product is dependent to a substantial degree upon the amount of chromium present. Thus, improved results are secured when a substantial quantity of chromium which may be as little as one percent by weight of the uranium is used. Excessive quantities of chromium are usually undesirable in uranium compositions which are to be subjected to use in those fields where use of uranium is more important. Consequently the uranium composition should at all events contain more than about 50 percent by weight of the composition, i. e., should be the predominant component thereof. For example, the addition of only 5 percent by weight of chromium to uranium increases the resistance to water corrosion thirty times over that of pure uranium alone. Alloys containing one to 20 percent by weight of chromium based upon the weight of uranium in general have the improved characteristics herein contemplated. These new and novel uranium-chromium alloys also generally possess improved hardness and are susceptible to heat treatment to further improve their desirable characteristics. For example, tests showed that pure uranium had a Rockwell A hard-

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ness of about 52. When 5 percent by weight of chromium was alloyed with uranium the Rockwell A hardness increased to 64. By quenching the 5 weight percent uranium-chromium alloy at about 800° C. and then annealing at 300° C. for two hours the Rockwell A hardness was increased to 72.

These new uranium-chromium alloys may be conveniently prepared by melting together the required amounts of uranium and chromium in a refractory crucible such as, for example, a beryllia-lined Alundum crucible. The uranium should be melted in the absence of oxygen or moisture, as, for example, in vacuo or in an inert atmosphere.

The alloys of the present invention are useful as protective coatings for masses of uranium which are to be exposed to the corrosive action of water. They are particularly valuable in increasing the resistance of uranium to corrosion by aqueous solutions containing hydrogen peroxide. These alloys are also useful as bonding agents to be interposed between uranium and another corrosion-resistant coating such as a pure chromium coating.

Having thus described my invention what I claim and desire to secure by Letters Patent of the United States is:

1. A corrosion resistant binary alloy of uranium and chromium consisting of about 95 weight percent uranium and 5 weight percent chromium.

2. A corrosion resistant binary alloy consisting of uranium and chromium, with the chromium content constituting from one per cent by weight to twenty per cent by weight of the combined uranium-chromium composition.

3. A new article of manufacture comprising a uranium base and a layer of a binary uranium-chromium alloy thereon, the chromium content of said alloy constituting from 1% to 20% by weight of said combined uranium-chromium composition.

4. A new article of manufacture consisting of uranium, a bonding intermediate layer of a binary uranium-chromium alloy thereover, and a surface coating of metallic chromium, said alloy having a chromium content of from 1% to 20% by weight of the combined uranium-chromium composition.

5. An article of manufacture having a surface consisting of a binary uranium-chromium alloy, the chromium content of said alloy constituting from 1 to 20% by weight of said combined alloy.

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