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METALLIC IMPREGNATED GRAPHITIC MATERIAL AND METHOD OF PRODUCING THE SAME

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9 Claims. (Cl. 106—1)

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This invention relates to a metallic impregnated graphitic material, and particularly to an improved copper or copper and iron impregnated graphitic material which is especially adapted for uses requiring a minimum of friction between rubbing or sliding parts, such as commutator brushes, bearings, and the like, and to a method of producing the same.

Heretofore, it has been suggested to manufacture graphitic materials for use as commutator brushes, bearings, and the like, by mixing carbon or graphite with a reducible compound or compounds such as metallic oxides or powdered metals so as to provide a solid and dense mass. While a graphitic material produced in such a manner is satisfactory in its use, it is relatively expensive to manufacture due primarily to the exorbitant cost and the inconvenience of obtaining the necessary raw materials.

In accordance with the present invention, it is proposed to provide an improved graphitic material by using a graphitic waste material from steel mills or foundries, commonly known as kish, which is treated with a suitable salt, such as copper sulphate. It will be understood that kish is a waste product which forms in ladles, or other containers, and on the surface of molten iron of high carbon content during the manufacture of steel and which can be easily and cheaply obtained and collected from the steel mills and foundries.

Accordingly, it is the general object of the present invention to provide an improved metallic impregnated graphitic material consisting of a mixture of kish and a powdered metal or metals, such as copper, and the method of manufacturing or combining the same.

It is another object of the invention to provide an improved metallic impregnated graphitic material which is made by treating kish with a soluble salt solution, such as copper sulphate.

It is a further object of this invention to provide an improved impregnated graphitic material which is simple and inexpensive in its manufacture, and efficient and effective in the uses to which it is adapted.

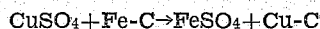
Various other objects and advantages of our invention will become more apparent during the course of the following specification and claims.

It will be understood that while natural graphite, as heretofore used for such a purpose, contains numerous oxide impurities and has no free metallic content, kish contains substantially no oxide impurities but does contain up to about 30 per cent, usually 20 to 30 per cent, of free metal-

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lic iron. In accordance with our invention, the free iron of the kish is replaced with a powdered metal such as copper, and it will be seen that it is the presence of the free iron in the kish that makes the present invention possible and practical. In other words, kish contains a considerable amount of iron, in a metallic state, distributed throughout the graphite.

According to the present invention, kish in its natural flaky form is treated with a soluble copper salt or compound, such as copper sulphate, in an aqueous solution. If it is desired, a finer grained kish, formed by grinding the flaky variety, may be treated as above mentioned. It has been found that one part of copper sulphate to five parts of water provides a solution of the proper concentration. The kish is mixed with the copper sulphate solution, heated, and maintained near boiling. During the heating of the mixture, a reaction takes place, i. e. the iron in the kish is dissolved and an equivalent quantity of copper is deposited in its place. The chemical reaction is substantially as follows:



The copper sulphate solution should contain as much of the salt as possible in order to keep the volume of the solution to a minimum. However, a twenty percent solution by weight is about the maximum workable due to the tendency of the kish to float in solutions of higher gravity. One part by weight of anhydrous copper sulphate will react with approximately one part of kish.

A copper sulphate solution when made from one part of copper sulphate and five parts of water is slightly on the acid side due to hydrolysis. During the reaction with the free iron in the kish, some iron hydroxide (probably both ferrous and some ferric) is precipitated. This accumulation slows down the copper for iron replacement reaction. Accordingly, it has been found that it is most desirable to add an acid to the mixture, such as sulphuric acid. It has been found that a 5 to 10 percent sulphuric acid solution is satisfactory for most uses. The amount of acid required in the mixture is about four to eight times the amount of iron present if the iron is to be reduced to a minimum and the time element is taken into consideration. However, if it is desired that the final product contain a small amount of iron, less acid would be used or the solution would be boiled a shorter length of time. The reaction can be arrested at any point by mere decantation.

The above procedure may be followed, or the

residual iron in the kish or graphitic material can be dissolved in an acid, such as diluted sulphuric acid, after it has been treated only with the copper sulphate solution but it is preferable that the acid be added to the mixture in the first instance as above explained, as this accelerates the reaction. If the kish is treated afterward with the acid, the copper solution is filtered off and the acid then added. In adding the sulphuric acid subsequent to the copper deposition step, the concentration of the acid necessarily must be low enough to prevent an oxidizing reaction. A solution containing 60 per cent acid maximum has been found to be satisfactory. Sulphuric acid solutions of sixty per cent or less will not affect the precipitated copper.

On a small scale, it has been found that 5 to 10 hours of simmering with the copper sulphate solution is necessary. The acid for iron elimination can be added then to the copper solution or the copper solution can be filtered off and the acid added only to the kish. A further boiling of 2 to 3 hours is then necessary for satisfactory results. On a large scale it will be understood that the time element may be increased or decreased in order to get the desired results. After the above treatment, the kish is filtered, washed and dried.

While in the present instance we have described the replacing of the iron in the kish with copper, it will be understood that it may be replaced with any other suitable metal or metals such as tin, lead, zinc, etc. Also, while it is preferable that sulphuric acid be used to dissolve the residual iron in the kish, it will be seen that any other suitable acid may be used to dissolve the same providing it does not produce an oxidizing effect.

It will be understood that this copper impregnated or copper and iron impregnated graphitic material is then made into commutator brushes, bearings, etc., in any suitable manner. This impregnated graphitic material has the following advantages over other similar compounds, (1) it contains less oxide contamination, (2) the copper is deposited very uniformly because of the perfect dissemination of iron throughout the kish, there being a chemical combination, (3) it is much cheaper to produce because it is made from a waste product.

As a result of our invention, it will be seen that there is provided an easy and convenient method of producing a metallic impregnated graphitic material by utilizing an heretofore waste material, namely, kish. By using kish, it will be seen that part or substantially all of the free iron therein can be inexpensively replaced with a metal, such as copper, so as to provide a satisfactory graphitic material for the use intended.

From the above description of our invention, it will be apparent that many modifications of the same may be devised within the scope thereof and all such modifications are contemplated as may fall within the scope of the appended claims.

We claim:

1. The method of producing a copper impregnated graphite material for use as commutator brushes, bearings and the like which comprises treating kish with a soluble copper compound whereby the iron in the kish is replaced by the copper of the solution, and subsequently treating the altered kish with an acid solution so as to dissolve any residual iron therein.

2. The method of producing a copper impregnated graphite material for use as commutator brushes, bearings, and the like which comprises

treating kish with a water soluble copper compound whereby the iron in the kish is replaced by the copper of the compound.

3. The method of producing a copper and iron impregnated graphite material for use as commutator brushes, bearings, and the like which comprises treating kish with a water soluble copper compound in such a manner that part of the iron in the kish is replaced by the copper of the compound.

4. The method of producing a copper impregnated graphite material for use as commutator brushes, bearings, and the like which comprises treating kish with a water soluble copper compound in an acid solution whereby the iron in the kish is replaced by the copper of the copper compound.

5. The method of producing a copper and iron impregnated graphite material for use as commutator brushes, bearings, and the like which comprises treating kish with a water soluble copper compound in an acid solution in such a manner that part of the iron in the kish is replaced by the copper of the copper compound.

6. The method of producing a copper impregnated graphite material for use as commutator brushes, bearings, and the like which includes the steps of mixing kish with copper sulphate, water, and diluted sulphuric acid, heating the mixture and maintaining the same near boiling until the iron in the kish is replaced with the copper of the copper sulphate, and finally separating the altered kish from the solution and washing and drying the same.

7. The method of producing a copper and iron impregnated graphite material for use as commutator brushes, bearings, and the like which includes the steps of mixing kish with copper sulphate, water and diluted sulphuric acid, heating the mixture and maintaining the same near boiling until the desired quantity of copper has been introduced into the kish by replacement of a portion of the iron, stopping the reaction by separating the altered kish from the solution, and washing and drying this altered kish.

8. A material for use as commutator brushes, bearings, and the like consisting of kish and a powdered metal.

9. A material for use as commutator brushes, bearings, and the like consisting of a mixture of kish and powdered metals.

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