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PROCESS OF MAKING POROUS BODIES

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This invention relates to the manufacture of a porous body which can be used as a filter as well as a diaphragm, with any desired degree of porosity and of strength, which can be adapted to the purpose in each case. The porous body made according to our improved process is therefore more particularly suitable as an ordinary filter for liquids or gases and as a diaphragm, chiefly for electrolytic or electro-osmotic purposes.

The filter or diaphragm produced according to our invention is a solid porous body constituted by at least one oxide of the heavy metals, preferably chromium oxide. It can be prepared for instance by pressing in moulds a mixture of chromium oxide with one or more other chromium compounds which, on being heated, decompose to chromium oxide, for instance chromium acid, chromium nitrate or organic chromium compounds, and by heating the moulded article until the other chromium compound is entirely or partly converted into chromium oxide. It is possible in this process, by altering the proportions of the mixture, the pressure, the temperature of heating or the time of heating, to obtain any desired degree of porosity. If for instance larger quantities of chromic acid, chromium nitrate or the like, are added, the porosity of the filter or diaphragm produced will be increased, all other conditions of manufacture remaining the same. By increasing the pressure, the porosity can be reduced, also by an increase of the temperature of heating or of the time of heating. Further, the mechanical strength or resistance can be increased, by both steps. The above mentioned steps can be used either alone or in any desired combination, in the manufacture of the new filter or diaphragm.

In accordance with the process of manufacture above described, there are mixed together, for instance, 18 grams of chromium oxide and 2 grams of chromic acid, and this mixture is compressed to form a circular disc by the use of a pressure of about 35 atmospheres on the whole surface, that is to say 3.5 atm. per square centimeter. The disc is then heated to about 700–800° C. and in that way a porosity of about 50% is obtained.

With the use of chromic acid as the mixture component for chromium oxide, it has been generally found that a heating of the moulded article to a temperature above 180° C. is required in order to convert chromic acid to a sufficient extent into chromium oxide. If necessary, we may add to the chromium oxide powder, besides the chromium compounds mentioned, other foreign substances functioning as temporary constituents the removal of which leaves voids or pores, for instance common salt or sawdust which are either burnt during the heating, or can be eliminated by means of solvents after the heating. In that way the porosity will be of course increased.

Another method of carrying out the process of manufacture of the new diaphragm or filter, consists in subjecting chromium oxide, if desired with the addition of other compounds such as for instance chromium trioxide, to a sintering process, and in giving to the solid body thus produced the desired shape by mechanical working or treatment, for instance by grinding. It has been found that in this way also it is possible to modify the porosity within certain limits by a suitable choice of the sintering temperature and of the length of time of sintering. Moreover, the chromium oxide may be subjected to a sintering process before the further treatment of, for instance, pressing.

In this way it is possible to modify the size of grain of the chromium oxide, and therefore to give the new filter and diaphragm any suitable porosity.

Finally, the new filter and diaphragm can also be manufactured by the treatment of chromium oxide with a suitable binding agent, for instance by causing it to set with cement, if desired with the addition of a filling material to be subsequently removed. The material is then first brought to the desired shape and converted into a body of a sufficient mechanical resistance by allowing it to stand in the open or by the use of other means. It is also possible to use at the same time as the filling material for instance chromic acid, chromium nitrate or the like.

The filter or diaphragm produced accord-

ing to our improved process is a body of a high mechanical strength, and it is practically not corroded by acids or lyes, so that it is particularly suitable for electrolytic or electroosmotic purposes. It can be used both as a vertical and as a horizontal diaphragm in electro-chemical apparatus. Instead of chromium oxide any other suitable oxide of a heavy metal may be used, such as zirconium oxide, and we desire it to be understood that the appended claims are to be interpreted as covering equivalents.

What we claim as our invention and desire to be secured by Letters Patent is:—

1. A process for the manufacture of filters or diaphragms, which consists in pressing in moulds a mixture of pulverized chromium oxide with one or more chromium compounds which can be decomposed to chromium oxide, and heating the moulded article until the other chromium compounds are substantially converted into chromium oxide.

2. A process for the manufacture of filters or diaphragms which consists in pressing a mixture of pulverized chromium oxide with one or more other chromium-oxygen compounds and with suitable void-forming foreign substances into moulds, heating the article until the other chromium compounds are substantially converted into chromium oxide, and eliminating the foreign substances.

3. A process for the manufacture of filters or diaphragms which consists in sintering a mixture of pulverized cromium oxide with other chromium oxygen compounds and mechanically working the material to get a body of the predetermined form.

4. A process for the manufacture of filters or diaphragms which consists in sintering a mixture of pulverized chromium oxide with other chromium-oxygen compounds and pressing the material in a mould.

In testimony whereof we affix our signatures.

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