

ALIEN PROPERTY CUSTODIAN

PRODUCTION OF BODIES WHICH ABSORB GASES AND VAPORS

Georges François Jaubert, Paris, France; vested
in the Alien Property Custodian

No Drawing. Application filed May 2, 1939

This invention relates to a process for the production of bodies which absorb gases and vapors and also to the bodies which are produced by this process.

The process according to this invention is more particularly applicable to halogenides in general and especially to alkaline, alkaline-earthly and earthy halogenides in order to render them porous, to increase their active surface as well as their absorbing power for certain gases and vapors such as steam, ammoniac gas, organic amines, pyridine, alcoholic and cetic vapors and the like, while permitting of regenerating them by a simple heating process at a temperature of about 100° C.

The process according to the invention consists in incorporating with the said substances, after having brought them previously to a liquid or half-liquid condition by melting or dissolving them a porous armature formed of fragmentary pieces of fibrous materials having a slight density such as infusorial earth, light vegetal carbon, light magnesia, through an operation which is preferably made in vacuo in order to obtain after drying a mass having a larger absorption power and a slighter density than the pure and anhydrous halogenides from which it is obtained.

Both examples which will be given hereunder show the application of the process to the sole halogenides of calcium and lithium, but this process is also applicable in a similar manner to the halogenides of glucinium, sodium, potassium, strontium, barium, magnesium, aluminium, zinc and the like.

EXAMPLE 1.—Active porous chloride of calcium

The hydrated chloride of calcium $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ melts, when heated, in its crystallisation water, then gradually loses the water which it contains, but it must be heated up to about 260° C. for removing the last molecule of water and obtaining a product which is completely anhydrous.

If the same anhydrous chloride is then further heated, it melts then in the red (at about 800°) and it is poured in this condition into metallic casks where it solidifies on cooling. Then it forms the molten chloride of calcium (density 2.26) which is found on the market and made on a large scale in the chemical industry.

The inventor has found that when chloride of calcium (in a solid condition or in solution or even in the form of anhydrous and molten chloride) is diluted with a small quantity of very porous bodies having a small specific weight such as infusorial earth (kieselguhr), light charcoal, light magnesia and the like, a mixture is obtained which can be dried, that is to say which can lose all the water which it contains through

heating it in the open air at a temperature of only 85 to 100° C., i. e. at a temperature which is nearly three times lower than the temperature which is necessary for drying hydrated non-mixed chloride of calcium.

The porous product which is obtained (having an apparent density which is generally less than 0.50) is much more active, contrary to what might be supposed, than pure chloride of calcium; thus it absorbs steam, anhydrous ammoniac, the organic amines, the alcoholic or acetic vapors much more strongly than pure anhydrous chloride of calcium.

For the production of the novel porous mixture the molten anhydrous chloride of calcium can be mixed at a high temperature with the diluent, which has been previously completely dried. It is also possible more conveniently to work in the cold through mixing the diluent with the hydrated chloride of calcium, i. e. either with a solution of chloride of calcium or with chloride of calcium which has been molten in its crystallisation water at a very low temperature. According to the chloride of calcium contents which it is desired to obtain in the finished product, an excess of solution of chloride of calcium with respect to the quantity of solid diluent is used or not used. Then the diluent is added, which can be infusorial earth, ordinary light vegetal carbon and the like.

At this moment, preferably but not necessarily, a vacuum is produced above the mixture in order to remove the air of the gases in the pores of the diluent as completely as possible, which causes the formation of an extensive foam. As soon as foam is forming only slightly the operation is stopped, i. e. the atmospheric pressure is restored, which forces the liquid to penetrate into all the pores of the diluent, then the solid product which has thus been impregnated in the cold with the excess of liquid is separated and this solid part is caused to dry in the open air at a temperature of 100° C. or, preferably, in a hot air stream at a temperature of the same order.

The following is a concrete example for the production of porous chloride of calcium having an apparent density of about 0.45. An excess (as, for instance, 10 to 12 liters) of a cold and rather concentrated solution of chloride of calcium having a density of 1.4 at a temperature of 15° C is used.

To this 1 kilogram of light granulated charcoal in grains having the size of small peas (either a little larger or a little smaller) is added and completely impregnated.

Then a sufficiently far reaching industrial vacuum of 5 to 10 millimetres of mercury, for instance, is produced above the solution.

First a strong foam is formed, then this kind of boiling process gradually diminishes.

At this moment the vacuum is released and the mixture is filtered or poured off, or it is centrifugated or simply allowed to drop.

Then the solid residue, which is still moist, is brought into a vented drying chamber which is heated up to about 100° C or, preferably, into a hot air stream at a temperature of the same order.

After a few hours a dry product is obtained which has a weight of about 4 kilogs and contains 75% of anhydrous chloride of calcium and 25% of carbon. Its apparent density is about 0,45.

Of course, this chloride content may vary a little according to the character of the carbon which has been selected and to its porosity.

The above given figures apply to a light carbon such as fir, poplar or the like light charcoal. Similar results are obtained when carbon is substituted by infusorial earth (dynamite earth), light magnesia and the like.

It is also possible to use either more or less carbon or other diluent and a plurality of diluents can also be mixed together; finally very active porous mixture are always obtained the chloride contents of which varies, but which are completely dehydrated when heated in the air up to temperatures of the order of about 100° C.

EXAMPLE 2.—Porous active chloride of lithium

Proceed exactly as described above for the example 1 and according to the concentration of the solution of chloride of lithium which is used dry products of any concentration may be obtained.

Thus, with a solution of 50% and with light carbon products are obtained which contain 50% of dry chloride of lithium and 50% of carbon. With more diluted solutions or, on the contrary, with more concentrated solutions and according to the porosity of the diluent which is used, finished products of any desired concentration are obtained.

The commercial importance of such porous and light halogenides can readily be conceived, for generally and almost in all their applications they are, when used as absorbents, much more stronger than the pure anhydrous halogenides from which they are derived and the density of which is much higher.

Furthermore, their production is less expensive because of the low temperature at which it is possible to free them from all the water which they contain in order to convert them into strictly anhydrous products so as to give them the maximum activity.

Moreover, when such novel salts are used as absorbents in their porous forms, whether steam or gaseous ammoniac or organic amines or alcoholic vapors and the like are concerned, they possess the quite particular property that they can be regenerated at a very low temperature while restoring the said gases or vapors, while the pure salts from which they are derived can be regenerated only at a much higher temperature, which often causes a partial decomposition of the so regenerated products.

GEORGES FRANÇOIS JAUBERT.