

# ALIEN PROPERTY CUSTODIAN

## PROCESS OF MANUFACTURING ALKALINE SILICATES IN POWDER FORM

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My present invention relates to the manufacture of alkaline silicates and its object is to make it possible to obtain such silicates, with various silica to alkali ratios, in form of powders of crystalline appearance, stable, and adapted to dissolve completely in water.

As is known, alkaline silicates are found on the market in form of syrupy liquids obtained by dissolving, under vapor pressure, vitreous silicates produces by fusion in a furnace of mixtures of sand and alkali in varying proportions. The liquid sodium silicate available on the market usually has a content of 36% sodium silicate, a specific weight of 38° to 40° Bé and a silica to soda ratio varying from 1,62 to 3,42.

In view of the inconveniences which result naturally from the liquid state of these products, i.e. relatively low concentration, high cost of packing and transportation, it has been proposed to prepare them in form of powders soluble in water at ordinary temperature and pressure, particularly for the preparation of so-called detergent powders.

Some of the process first proposed to this end were based on hydration of the vitreous silicate and others on the drying of the liquid silicate finely pulverised in a hot current of air. The silicates thus prepared, however, usually had at least one of the following drawbacks: tendency to agglomeration, hence lack of stability; low solubility in water, especially with products rich in silica; impossibility of obtaining a concentrated solution.

In order to avoid these inconveniences a process was proposed, which made use of the crystallisation in bulk of a solution of silicate of sodium previously brought down to predetermined silica, soda and water contents by additions of caustic soda to the commercial sodium silicate and subsequent evaporation. This crystallising process, however, allows of obtaining only the metasilicate (i.e. the salt with a silica to alkali ratio=1) but it is not suitable for the production of silicates with high silica contents, more particularly the trisilicate ( $\text{Na}_2\text{O} \cdot 3\text{SiO}_2$ ) which has marked colloidal properties. Now it is particularly desirable to obtain silicates with high silica contents, in the form of a soluble powder, as they have a very marked detergent action.

The process according to the present invention makes it possible to obtain, in the form of a stable and soluble powder, silicates with high silica contents, that is having a silica: alkali ratio equal to 2 or greater than 2. It is based on the property of solutions of silicates with relatively high silica

contents, of forming precipitates in presence of certain organic or even certain inorganic bodies. This property, until now, has not been used commercially, because, even after draining, the precipitates still retain a substantial amount of water and of precipitating agent so that when exposed to the atmosphere or when heated they again become gelatinous.

In accordance with my present invention, after having treated by a coagulating agent a solution of alkaline silicate, for example a commercial liquid silicate, I subject the coagulated mass to a treatment that causes the elimination of the water in presence of the coagulating agent employed. To that end I may subject the mass to pressure or let it stand while opposing the evaporation of the coagulating agent, which usually is more volatile than water.

After the liquid has separated, the mass forms a hard and brittle cake which I reduce to powder, and said powder then is dried under continuous stirring at a temperature not exceeding 45°C. After a short time, the grains take the appearance of small hard crystals, of uniform size and transparent, having a composition corresponding to that of the silicate or silicate mixture used as a starting material, which composition may reach or exceed a silica:alkali ratio=3. As to the water content, it may vary according to the duration of the drying operation.

A great advantage of the silicates obtained by this process is that they dissolve, without stirring, in water, even in cold water.

As coagulating agent I may use an alcohol, an acetone or other suitable organic compounds, in small amount, or also some inorganic compounds such as ammonia.

By way of example, a method of preparing sodium trisilicate now will be described:

To 1000 gr. of commercial liquid so-called neutral silicate having a silica:soda ratio=about 3 and a specific weight of 39° Bé, I add 100 cubic centimeters of methyl alcohol while stirring until I obtain a rather compact mass similar to white cheese. This mass is immediately subjected to pressure in a press with a perforated basket adapted to produce a pressure of about 30 atmospheres and collect the liquid expressed. This liquid which contains the larger portion of the alcohol used, is subjected to distillation in order to recuperate the alcohol.

The product withdrawn from the press is a hard and brittle cake which is not sticky and can be easily reduced to powder form. This powder is dried under continuous agitation for

about 2 to 3 hours at a temperature not exceeding 45°C.

Instead of subjecting the mass to pressure, I may place it on a porous surface, for example in a bag of woven fabric, which is enclosed for 24 hours within a closed receptacle having a capacity only a little greater than that of the bag in order to prevent evaporation of the alcohol.

Under these conditions the coagulum contracts, expulses the impregnating liquid and forms a hard and brittle cake, while the liquid collects at the bottom of the receptacle. As above the cake is reduced to a powder and said powder is dried.

In both cases, after drying the product has a crystalline appearance; it is dry and fluid; on

being analysed it is found to answer the formula:  $\text{Na}_2\text{O} \cdot 3\text{SiO}_2 \pm 6\text{H}_2\text{O}$ . This product may be partly dehydrated by slow heating at a temperature comprised between 45° and 100°C.

The powdered silicates prepared in the manner described keep a crystalline, dry and fluid appearance even after a few days' standing in the atmosphere, and they dissolve easily in water, thus permitting the preparation of highly concentrated solutions, even in cold water. Said products having a high silica content, I may, in order to obtain any desired silica:alkali ratio, mix them with caustic soda, either in dry powder form, when using them in the dissolving bath.

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