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PROCESS FOR THE PREPARATION OF AGGLOMERATES

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It is known that alcaline silicates of various chemical compositions may be used as agglomerating agents for various substances. These silicates, however, do not exert their effect immediately, and the products thus obtained must be subjected to drying, generally for a long time, at temperatures between 150 and 300° C. Many chemical compounds have been over and again proposed for reducing the binding time of silicates and the heating time required for hardening the agglomerates.

The applicant has found that it is possible to eliminate entirely the drying operation by using silicates belonging to a particular class and presenting certain characteristic physical properties. These silicates correspond to solutions of various concentrations, with various values of the ratio SiO_2/Na_2O, but such that:

1. Subjected to natural evaporation, in a thin layer, they will yield a residue in the form of a supple, thin, elastic film, entirely different from the hard aggregates, difficultly scratchable, given by the silicates usually used and in which the SiO_2/Na_2O ratio is generally high. The silicates proper for use in the method according to the present invention must have a SiO_2/Na_2O ratio ranging from 1.9 to 3.1, and preferably from 1.9 to 2.8, and

2. The viscosity of the solutions of these silicates lies between perfectly defined limits, varying with the nature of the body it is required to bind and with the conditions of agglomeration; the viscosity of the solutions usable according to the invention must be higher than 100 centipoises.

The silicates with a molecular ratio SiO_2/Na_2O ranging from 1.9 to 2.8, particularly, possess the following properties:

a. They permit to adjust easily, by concentration, before and after mixture with the products to be agglomerated, the viscosity to a value such that when the products are taken out of the molds, their cohesion is sufficient, without any risk of the drawbacks usually encountered, due to a too sudden solidification of the agglomerating agent.

b. They are more stable than the silicates with a high percentage of silica (higher than 3.1); the decomposition of the latter is set up more easily by a great number of different substances, and, especially by the substances contained in the products to agglomerate. They yield in this case a gelatinous silica which, when dry, has only a weak agglomerating power. The silicates with a molecular ratio SiO_2/Na_2O ranging from 1.9 to 3.1, on the contrary, decompose only much more difficultly.

An advantageous method for carrying into practice the process according to the invention is to subject the paste formed by the substance to agglomerate and the solution of alcaline silicate to a first heating adapted to bring the paste to a well determined state of dryness (moisture contents of from 2 to 4%), corresponding to a sufficiently high viscosity of the silicate, without however attaining complete dryness of the product.

The binding of the silicates may be accelerated by the use of catalysers reducing the time necessary for the cohesion to attain a sufficient degree. The proportion of catalyser to be introduced depends upon the characteristics of the silicate used, upon the particular operating conditions, as well as upon the nature and use of the agglomerates desired. It is possible to do away entirely with the catalysers by using silicates suitably chosen, and particularly silicates having a SiO_2/Na_2O ratio lying between 2 and 2.6.

The catalysers proposed must belong to the group of wetting or emulsifying agents, or of bodies having an active radical setting up a superficial concentration of the silicate in their immediate neighbourhood and, consequently, the formation of a film having all the characteristics of the coagulum defined above. It is, on the contrary, important to exclude, whatever the class of silicates adopted, all the bodies bringing about a binding of the silicate in a massive form or in the form of clots of variable hardness.

The above invention applies to the agglomeration by means of silicates, of a very great variety of substances, such as various sorts of coal, ores, foundry sand, road coverings etc.

The following examples are given as an indication, without any limitative character whatsoever:

Example 1

Coal of any sort, anthracitous, bituminous or other, is mixed with 10% of sodium silicate having a SiO_2/Na_2O ratio of 2.7, in solution at 51° Bé, and with 0.25% of a wetting agent such as a sulphonated naphthaline. The paste is heated up to suitable dryness at a temperature ranging from 50 to 95° C, and subjected to pressure in a hydraulic press or a ball press.

At their issue from the press, the agglomerates have a suitable cohesion, permitting to load them directly into trucks. The cohesion increases rapidly with time for attaining a maximum after about one hour.

Example 2

An anthracitous, bituminous or other coal is mixed with 10% of sodium silicate having a SiO_2/Na_2O ratio of 2.2, in solution at 55° Bé, the operation being effected in a mixing screw. The paste obtained is dried at 80–85° C and compressed without adding any catalyser. At their issue from the press, the agglomerates may be immediately loaded on trucks.

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