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GAS-CONCRETE MASS AND METHOD FOR ITS PRODUCTION

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In the known methods for preparing gas-concrete a so-called gas generator is mixed with the solid substances. The gas generator is a substance for instance aluminium powder, calcium powder, powder of aluminium alloys and so forth which reacts with the constituents of the mortar and preferably with the water, under development of gas. Notwithstanding the most uniform distribution of the gas generating substances an absolutely uniform structure of the concrete mass was never obtained. At certain points of the bodies of gas-concrete accumulations of gas or larger gas bubbles are present than at other points. The solidity is therefore considerably impaired. Further the larger gas bubbles escape more easily owing to their stronger buoyancy, this meaning a loss in gas formers.

The invention has for its object to ensure a uniform structure of the gas-concrete, which means that the gas bubbles are uniformly distributed in the mass. Another object of the invention is to obtain the greatest possible strength of the finished product. The invention has further for its object an economy in the quantity of gas formers which have to be employed.

It has been found that the strength properties are considerably improved, if the gas-concrete contains in such uniform distribution as possible gas bubbles of, at the utmost, 0.5 mm diameter, preferably of a diameter of about 0.005 to 0.5 mm or if bubbles of this size form at least the chief portion of the visible pores and are of closed shape in opposition to the known kinds of gas-concrete.

Gas-concrete masses of this character are obtained, according to the invention, by a special treatment of the gas former. It is for instance possible to obtain light building materials of a weight per unit of volume from 0.5 to 1.0 which, as regards strength, cold resisting property, insulating effect and so forth, are much superior to the known gas-concrete masses with this weight per unit of volume. A uniformity of the pore-distribution and an equalisation of the pore size may be obtained thereby, that the gas formers to be added to the mass are not used in the state in which they are supplied but are deposited as coating on a finely distributed carrier substance. This can be done for instance by grinding the gas former together with the mortar mass, preferably prior to the adition of the mixing water, this grinding together lasting for a long time, generally several hours. It is advisable to strongly deposit the gas former on to the carrier substance prior to the mixing in the mortar mass, especially prior to the addition to the mixing liquid.

One of the components of the mass or a portion of one of the components may serve as carrier substance. If the gas-concrete is formed, for instance, of cement and sand, a small calculated quantity of aluminium powder or the like can be added at the grinding of the cement clinker or at the grinding of a portion of the cement clinker. By the grinding this powder is deposited on the surfaces of the fine and finest cement particles which are formed. On the other hand, the aluminium powder or other powder can be ground into the sand or into a portion of the sand, before it is added to the gas-concrete raw mixture.

A special carrier substance, such as for instance pulverised slag, may further be used. Carrier substances are preferably used, which are harder than the substance developing the gas. In order to avoid detaching of the particles of aluminium powder or the like, the carrier substance may be united, at the mixing or before the mixing, with any sticking, preferably not water soluble substance, such as bituminous material, with wax, paraffine, resin, or similar substances.

Generally it is more favorable, to unite the gas developing powder and the carrier substance not in a mixing apparatus, but to grind the powder together with the sand or other substance for several hours, for instance in a ball mill. Generally, for instance when grinding with normal coarse-grained sand, a grinding duration of 5 hours will be sufficient. For softer substances, such as slag, 3 to 4 hours of grinding are already sufficient. On the other hand, the grinding period may be extended to 36 hours and more without any objection. By the grinding the adhesion is improved and at the same time the metal powder is extremely finely distributed, and so fine as it would be never possible when it were ground alone.

According to the invention the chief thing is, that the pores in the mass to be solidified are of very small size, because, with increasing fineness of the pores, the uniform distribution is still better ensured than with coarser pores, and because in this instance the danger is excluded that demixing may occur by rising of the gas bubbles to the surface. At the same time an economy in gas formers is attained, which amounts to approximately 20% compared with the known methods.

The manner and duration of the grinding de-

pends on the grinding apparatus used, on the type of gas former, and on the hardness of the carrier substance which is used. As a rule it has to be considered that, for instance at the grinding with aluminium powder, the carrier substance has to be disintegrated so much that on a sieve of 4900 meshes it leaves only a rest of at the utmost 10%. The material may be ground even much finer. For reasons of economy it is, however, advisable to not exceed a fineness of 5% rest on the 10000 mesh-sieve. On the ground mixture it can be ascertained, that the gas former particles, which for instance with aluminium represent thin leaves before the grinding, adhere on the carrier particles as uniform coating.

The application on to the carrier substance, the uniting with the same and, if desired, the more extensive parcelling of the gas driving medium by grinding ensure, that in the mass to be raised no accumulation of gas raising media takes place at individual points, thereby otherwise at these points coarse pores would be produced. This was, as has been surprisingly ascertained, the chief reason for irregularity of the structure, for lowering of the strengths, for lacking frost resistance.

Experiments made by the inventor have shown, that for instance in a mass of gas-concrete to be produced from cement and sand with a weight per unit of volume of only 0.8 a strength of about 30 kg/qcm at the best could be attained according to the usual methods. If, however, $\frac{1}{5}$ of the quantity of the sand was ground during about 5 hours with the aluminium powder, the resistance rose to 80 kg/qcm, the weight per unit of volume of the gas-concrete being the same.

These figures show that by corresponding distribution of the pores, by keeping them uniform and further by the greatest possible reduction of the same, effects can be obtained which could not be expected.

In which manner the solidification of the bodies takes place, whether—as is possible when starting from cements or cement containing mixtures—by hardening on the air or by the action of steam under pressure, as is chiefly suitable when starting from common mortar, is indifferent. Any known hardening method may be employed, and also relative to the building-up of the raw mixture the widest range is allowed. Light stones of lime sand, for instance, can also be produced according to the new method.

It is particularly advisable to work, deviating from the usual method for producing gas-concrete, with masses poor in water, for instance with such masses which are near the plastic consistency. The quantity of water used in the method according to the invention can be reduced generally by about 20% compared with the known methods for producing gas-concrete.

Example

170 kg Portland cement, 380 kg sand flour (in the fineness of the usual Portland cement, which means about 10% rest on the sieve of 4900 mesh) are intimately mixed with 20 kg of a mixture of 20 kg ground sand and 350 g aluminium powder produced by grinding during 5 hours and with 440 l water. The mass is poured into molds and left to rise. The rising is terminated after about 30 minutes. The mass is then left standing for other 24 hours. The mass on top is then stripped off, and the bodies are removed from the molds after they have been stored again for 24 hours. They possess then sufficient handling strength. The bodies are then brought into hardening boilers and treated in them with steam of 10 atü during 8 hours. After the hardening drying of the bodies takes place.

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