

学位論文要旨

Crystallization of Stratlingite in High Alumina Cement Hydrates

with Silica Fume at Different Curing Temperatures and Terms

(異なる養生温度と養生期間に於けるシリカフュームを添加したハイアルミナセメント水和物中のストラトリンジャイトの結晶化について)

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Calcium aluminate cement (CAC) pastes with silica fume (SF) mixed with or without sodium tripolyphosphate (TPP) deflocculant were studied in this study. The mixed pastes were casted into bottles or onto glass slides, and then cured at 10°C, 21°C, 30°C, 35°C, 50°C and 60°C. The time-dependent changes in the samples were analyzed by XRD. The selected samples were observed by EPMA and FE-SEM. Several conclusions can be drawn from the present study as follows:

- (1) In the samples with TPP, regardless of the curing temperature, the early crystallization of stratlingite was observed because of the presence of sodium ions. The stratlingite formation was further accelerated at higher curing temperature.
- (2) EPMA analyses showed that SF developed in and around large plate-like crystals with a smooth surface, of which chemical composition corresponds to that of stratlingite. The analyses of what appears to be a rough surface show variations in a molar ratio of SiO₂, mainly higher ratio than that of a theoretical composition.
- (3) FE-SEM images show that a rough surface of big plate-like crystals is covered with small grains of SF. These platy crystals were identified by EDX analyses as stratlingite characterized by a higher SiO₂ molar ratio. This higher molar ratio of SiO₂ can be explained by the contamination of these SF grains.
- (4) C₂AH₈ hydrate has crystallized in almost all of the samples from the beginning of hydration, and its formation was further accelerated at higher

curing temperature. At 50°C or more, the intensity appeared transiently and disappeared soon, and crystallization of stratlingite was observed. This is because the C_2AH_8 hydrate was found to convert to stratlingite.

(5) Even after long-term curing, the peaks of the XRD intensity of stratlingite, gibbsite and C_3AH_6 hydrates still remain in the bottle samples, regardless of the presence or absence of TPP. Stratlingite, gibbsite and C_3AH_6 hydrates are considered to be stable phases, if the hydrates do not react with CO_2 present in the atmosphere.

(6) Sodium ions accelerate not only the crystallization of stratlingite but also the crystallization of C_2AH_8 and carbonation as well.

(7) Vaterite and aragonite appeared after the crystallization of calcite, but almost all of them disappeared rapidly.