

Binding Phases in Construction Materials

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Binding phases in construction materials nowadays tend to be produced in more friendly environmental way because of world-energy crisis and -ecology constraint. The most famous binding materials which have been using since many decades ago are aluminosilicate glassy phases and Portland cement (PC) for fired and unfired products, respectively. Compared with ceramic industry, cement industry suffers the blames of much greater CO₂ emission and higher energy consumption. Therefore, material chemist, ceramist and cement technologist input a huge effort to a search for alternative binders. Special cements viz., high belite and high sulfoaluminate cements are considered to be one of the effective alternatives for PC replacement due to a possibility in a use of industrial wastes such coal ashes and less energy consumption in the production. In addition, very high early strength can be approached dependent on additional gypsum content. High lime based cement, a kind of Roman cement, is in addition reconsidered recently as an effective binder due to the revolution of carbonation solidification obtained by microbial and other chemical activations. Another binder which is expected to play a great role in construction and ceramic industries as a green material in soon future is geopolymeric material, a kind of alkali activated aluminosilicate binder. Geopolymer is considered to be superior to traditional binders in many aspects such as be able to produce various useful phases (zeolite, nepheline syenite, etc.) incorporating with geopolymeric phase using several inorganic wastes as starting materials, able to fabricate into various forms, able to resist to disintegration when is exposed to high temperature dependent on its SiO₂/Al₂O₃ ratio and able to contribute to the conservation of primary resources such energy and raw material. Due to the above mentioned characteristics and properties, geopolymer is, therefore, recognized as “ceramic without firing” which would be highly supportive to the future of world construction materials.