

DOI: <https://doi.org/10.5281/zenodo.12603484>

CALCIUM BINDERS: COMPOSITION, TYPES AND APPLICATION

Khojimatov Alisher Nazirjonovich,

Teacher of the Department of Inorganic Chemistry,
Faculty of Natural Sciences, Namangan State University

Tursunboev Khusayn

Namangan State University, Faculty of Natural Sciences,
2nd year student of Chemistry

tursunboyevxusaynjon@gmail.com

Abstract: *Calcium binders (or calcium-cement binders) are widely used materials in the construction industry. These binders play an important role in the construction of various structures, as they create concrete with high strength and durability. In this article, we will discuss in detail the composition, types and uses of calcium binders. Let's consider the main advantages and disadvantages of calcium binders.*

Key words: *calcium silicates, silicate gel, carbon dioxide, global warming.*

Аннотация: *Кальциевые вяжущие (или кальцево-цементные вяжущие) являются широко применяемыми материалами в строительной отрасли. Эти вяжущие играют важную роль при возведении различных конструкций, так как создают бетон высокой прочности и долговечности. В этой статье мы подробно обсудим состав, виды и применение связующих кальция. Рассмотрим основные преимущества и недостатки кальциевых вяжущих.*

Ключевые слова: *силикаты кальция, силикатный гель, углекислый газ, глобальное потепление.*

***Annotatsiya:** Kalsiyli bog'lovchilar (yoki kalsiy-sement bog'lovchilari) qurilish sanoatida keng qo'llaniladigan materiallardir. Ushbu bog'lovchilar turli xil inshootlarni qurishda muhim rol o'ynaydi, chunki ular yuqori mustahkamlik va chidamlilikka ega bo'lgan beton hosil qiladi. Ushbu maqolada kalsiyli bog'lovchilarining tarkibi, turlari va ularning qo'llanilishi haqida batafsil to'xtalamiz. Kalsiyli bog'lovchilarining asosiy afzalliklari va kamchiliklarini ko'rib chiqamiz.*

***Kalit so'zlar:** kaltsiy silikatlar, silikat gel, karbonat angidrid, global isish.*

Calcium binders: Calcium binders mainly consist of calcium silicates. Their main components are calcium oxide (CaO) and silicon dioxide (SiO_2). These components are synthesized at high temperature and result in the formation of calcium silicates. When calcium silicates react with water, they form calcium hydroxide ($\text{Ca}(\text{OH})_2$) and silicate gel, which causes the concrete to harden. The main types of calcium binders include: portland cement, alumina cement and slag cement [1].

Calcium binders:

Portland cement. Portland cement is the most commonly used calcium binder. This cement contains a high amount of calcium silicates, which help the concrete harden quickly. Portland cement is widely used in various fields of construction, including the construction of roads, bridges and buildings. It is distinguished by its high strength and durability.

Alumina cement. Alumina cement is produced on the basis of calcium aluminates. This cement has high heat resistance and fast hardening properties. Alumina cement is commonly used in high-temperature environments, such as in the metallurgical and chemical industries. Since alumina cement has high mechanical strength, it is used in special constructions.

Slag cement. Slag cement is made on the basis of slag obtained from the metallurgical industry. This type of cement is more environmentally friendly and uses less energy in its production. Slag cement has the properties of durability and water

resistance. It is also characterized by long-term stability and resistance to chemical effects [2] .

Calcium binders Application :

Calcium binders are used in the production of various building materials. Their main uses are as follows:

In concrete production:

Calcium binders are the main component in concrete production. Concrete is a mixture of cement, water, and aggregates (sand, gravel). Calcium binders provide a strong and durable structure during the hardening process of concrete. Concrete is widely used in construction because it has a high load-bearing capacity.

In the production of lime and gypsum:

Calcium binders also play an important role in the production of lime and gypsum. Lime and plaster are used in construction for plastering internal and external walls. Their mixture contains calcium hydroxide, which helps the materials to harden quickly and become strong. The use of lime and plaster accelerates construction work and increases the durability of structures.

In special building materials:

Some special construction materials, such as fire- resistant materials, are made on the basis of calcium binders. These materials retain their properties even at high temperatures. Special building materials can also be resistant to the effects of chemicals, which allows them to be widely used in industrial facilities.

calcium binders:

- **Durability:** Concrete produced on the basis of calcium binders has high durability. This ensures long-term stability of structures.

- **Fast setting:** Calcium binders such as Portland cement set quickly and speed up the construction process. This is especially important in fast-paced construction.

- **Durability:** These materials show high resistance to water, fire and chemicals. This ensures the long-term use of the facilities.

Disadvantages:

- **Environmental impact:** The production process of calcium binders consumes a lot of energy and emits a lot of carbon dioxide (CO₂). This causes global warming and environmental problems.

- **Cost:** Some calcium binders, such as alumina cement, are expensive. This can increase the overall cost of construction projects.

- **Manufacturing challenges:** The production of calcium binders requires complex processes and requires the use of high technology [3] .

In conclusion, it can be said that calcium binders are an integral part of the construction industry. Due to their high strength, durability and fast hardening properties, these materials are widely used in the production of various constructions and building materials. At the same time, it is necessary to consider factors such as environmental impact and cost. In the future, research will be continued in the direction of reducing the environmental impact of the production of calcium binders and reducing their cost. This article is written to provide an overview of calcium binders, a topic that requires further research and the application of new technologies.

REFERENCES:

1. Hewlett, P. C. (Ed.). (2003). "Lea's Chemistry of Cement and Concrete". Elsevier.
2. Mehta, P. K., & Monteiro, P. J. M. (2014). "Concrete: Microstructure, Properties, and Materials". McGraw-Hill Education.
3. Juenger, M. C. G., & Siddique, R. (2015). "Recent advances in understanding the role of supplementary cementitious materials in concrete". Cement and Concrete Research, 78, 71-80.