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**GYPSUM IN CONSTRUCTION FROM ANCIENT TIMES TO PRESENT
DAY**

Abstract: the industrial use of products containing calcium sulfate is not only economically, but also environmentally significant, on the possibility of increasing its strength by adding various modified additives to gypsum binders obtained on the basis of waste considered. In addition, scientific research works on increasing the strength by adding traditional chemical additives used for ordinary construction plaster are described.

Keywords: history of gypsum mineral raw materials, gypsum, anhydrite, binder, solution.

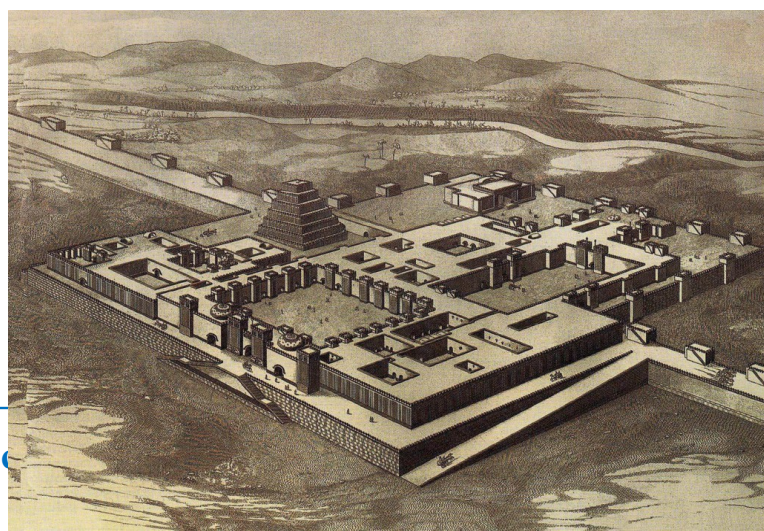
Gypsum binders are one of the first artificial binders that were obtained in the history of human civilization and have been used in construction from the era of the Ancient World to the present day. They are obtained by firing gypsum stone and then grinding it. Gypsum stone was formed as a result of the evaporation of the world's oceans 150–200 million years ago and is found in the form of dihydrate and anhydrous calcium sulfate – gypsum and anhydrite.



According to various sources, gypsum binders were first produced and began to be used in construction in various regions of the world in the period from the 11th to the 5th millennium BC. e. They found application in the greatest volumes in the form of building semi-aqueous gypsum, obtained by firing at a temperature of 130–180 °C, in the 3rd–2nd millennia BC. e. – in the form of plastering, masonry and finishing mortars.

Fig. 1. Pyramid of Cheops. Egypt

The masonry gypsum mortars and plaster in the Cheops pyramid (Fig. 1) and the tomb of his mother, in which the gypsum content is 97.3–9.5%, were of especially high quality. From the 3rd millennium BC. e. building gypsum was used in clay-gypsum, gypsum-clay-lime and gypsum-lime masonry and plaster



mortars. In the 1st millennium BC. BC, in particular, Sargon's palace was built in the city of Mosul (Fig. 2), which had more than 200 rooms plastered with gypsum-lime mortars. In certain regions of the world from the 3rd millennium BC.

Fig. 2. Sargon's Palace in Dur-Sharrukin, the capital of Assyria

Anhydrite binders, obtained by firing gypsum dihydrate and anhydrite at different temperatures, have found use. A two-phase gypsum binder has also found use, consisting of semi-aqueous gypsum and soluble anhydrite, obtained by firing gypsum stone at a temperature of 300–400 °C. This binder with higher strength and extended setting time with semi-aqueous gypsum has become widespread for plaster, masonry mortars and self-leveling floors, which are used in certain regions of the world to this day. In the middle of the 3rd millennium BC. e. In the city of Mohenjo-Daro in India, the walls of some buildings were covered with light gray gypsum mortar with the addition of sand, clay and lime flour.

From the 2nd millennium BC. e. In India, construction used predominantly high-fired gypsum, obtained by firing natural gypsum or anhydrite at temperatures of 800–950 °C, which differs from the previously mentioned gypsum binders in its increased water resistance and was used in gypsum-clay, gypsum-clay-lime and gypsum-lime masonry and plaster mortars in various buildings and structures, including hydraulic engineering. At that time, high-fired gypsum was called hydraulic, although in fact it did not meet modern requirements for hydraulic mineral binders.

From the end of the first half of the 1st millennium BC. e. and until the beginning of the second half of the 1st millennium AD. e. Building gypsum was widely used in construction in Ancient Greece and Ancient Rome, used primarily for plastering and finishing internal walls and columns in the form of gypsum and gypsum-lime mortars, into some varieties of which marble crushed into dust was introduced (such solutions were called “knock”). During the same

period of time, in Ancient Greece and Ancient Rome, marble powder was added to gypsum binder in combination with quartz and adhesives, thereby obtaining artificial marble for the manufacture of architectural details and statues.

During the Middle Ages and the Renaissance, many outstanding monuments of construction art were built using gypsum, clay-gypsum and gypsum-lime binders in masonry, plastering and finishing mortars. From insignificant in the era of the Ancient World to widespread since the 5th century, the use of gypsum binders in Central Asia, Transcaspia, Transcaucasia, the city of Bulgaria, and Mexico has increased. In Central Asia and the Caucasus, in monumental and civil construction, varieties of clay gypsum were used in the form of a binder - “ganch”, “gazha” and “azryk”, fired at a temperature of 130–



170 °C. Using masonry and plaster mortar based on them, the mausoleum of Sultan Sanjar (Fig. 3) and a bridge across the Murghab River were built in Old Merv (Turkmenistan) in the 12th century; baths in Bukhara, still in use today.

Fig. 3. Mausoleum of Sultan Sanjar. Turkmenistan

Since the beginning of the 15th century, most residential buildings in the central Aztec city of Tenochtitlan (near modern Mexico City), built of mud brick, were covered with dazzling white gypsum plaster.

Literature:

1. Rakhimov R.Z., Khaliullin M.I. Sostoyanie i tendentsii razvitiya promyshlennosti gipsovykh stroitel'nykh materialov [State and development trends of the gypsum building materials industry]. In: Stroitel'nye materialy, 2010, no. 2, pp. 44–46.

2. Rakhimov R.Z., Rakhimova N.R. Stroitel'stvo i mineral'nye vyazhushchie veshchestva proshlogo, nastoyashchego i budushchego [Construction and mineral binders of the past, present and future]. In: Stroitel'nye materialy, 2013, no. 5, pp. 57–59.

3. Gips ego ispol'zovanie i primeneniye [Gypsum, its use and application]. In: Materialy mezhdunarodnoi nauchno- prakticheskoi konferentsii [Materials of the international scientific and practical conference]. A.F. Bur'yanov and I.V. Bessonov (eds.). Moscow, Reklama i prodvizhenie Publ., 2015.

4. Мирзажонов, М. А., & Отакулов, Б. А. (2018). Влияние на прочность контактной зоны рабочего стыка времени выдержки нового бетона. In xliii international scientific and practical conference" international scientific review of the problems and prospects of modern science and education" (pp. 22-24).

5. Мирзажонов, М. А., & Отакулов, Б. А. (2018). Восстановление разрушенных частей бетонных и железобетонных конструкций. Достижения науки и образования, (13 (35)).

6. Xalimjon o'gli, S. J. (2021). Influence on durability of contact zone of working joint time of the endurance of a new concrete. EPRA International Journal of Environmental Economics, Commerce and Educational Management, 8(5), 1-2.

7. Otakulov, B. A., Karimova, M. I. Q., & Abdullayev, I. A. (2021). Use of mineral wool and its products in the construction of buildings and structures. Scientific progress, 2(6), 1880-1882.

8. Otakulov, B. A., Abdullayev, I. A., & Sul'tonov, K. S. O. (2021). Raw material base of construction materials and use of industrial waste. Scientific progress, 2(6), 1609-1612.