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Research Article

THEORETICAL BASIS FOR THE MANUFACTURE OF SODIUM SILICATE PENTAHYDRATE

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ABSTRACT

In this article, we look at the cutting-edge research and innovation that is transforming the sodium silicate pentahydrate production landscape. We will explore the basic conditions and scientific principles behind this technology, providing a comprehensive overview of the process from liquid glass processing to the production of the pentahydrate product. Additionally, we'll look at the potential economic, environmental and industrial impacts of this homegrown advance, illuminating how it could reshape the global sodium silicate market.

KEYWORDS

Domestic liquid glass, building materials, industry, chemical compounds, synthesis, sodium silicate pentahydrate, extraction, technology.

INTRODUCTION

The term “liquid glass” is the general name for compounds formed by the reaction of sodium or potassium silicate with a mineral acid. The use of the term "liquid glass" to describe silicate suspension products has led to considerable confusion due to the lack of a clear definition of liquid glass. Historically, the term "liquid glass" was used to describe silicate solutions whose solubility exceeded the solubility limit of anhydrous silicates, and was usually prepared by dissolving silicon with an alkali metal carbonate and then dissolving it in water. This variety has been widely used in heavy industries such as mining, metalworking and ceramics. With the development of hydrated silicates, the term "liquid glass" became increasingly used to refer to these silicates, and as the number of silicate types and manufacturers increased, the term became less specific. As a result of uncertainty as to what grade of silicate is required for a particular application, the term "water glass" is not used and a more precise specification is usually required. Liquid glass, a mixture of silica and alkali, has been used since the early 19th century. Application, drying time, adhesion and tensile strength make the specification of each silicate model very important for each of the applications mentioned above.

Nowadays, sodium silicate is very important due to its use in various fields. The main consumers of sodium silicate are synthetic detergents and the cardboard industry. If we trace the history of these industries, we will see that the growth of the detergent industry largely depends on the growth and production of washing machines. The increased demand for automatic washing machines has increased the demand for sodium silicate, which is used as a binder, buffer and anti-corrosion agent in the production of household washing machines. Sodium silicate has been found to be very useful in the production of detergents used in dishwashers. Using sodium silicate acid recycling technology, corrugated cardboard can be processed into recycled cardboard and boxes. Sodium silicate has been found to be useful in the following applications: binder for waste paper recycling, reinforcement and bonding processing, internal sizing and reinforcing additive. Without sodium silicate there are no other possible alternatives to the above conditions. This shows that the production of detergents and paperboard depends on sodium silicate.

Consumer concerns about the environment, coupled with industry pricing pressures, are driving demand for environmentally friendly chemicals. This has led to an increase in the use of liquid sodium silicate as a raw material instead of solid silicate or potassium silicate.

MAIN PART

The goal is to create an industrial database of the characteristics and properties of these types of silicates and their response or effectiveness at various industrial scales. This allows for the intelligent development of new products and processes, and the determination of the amount of silicate required for a particular application with greater accuracy than is currently possible. This can only encourage further research into silicates that will benefit the industry. Erosion of the basis of inorganic materials and reactions can only occur at the stage of complete knowledge of the mechanism of these materials. This increases the likelihood that the detected program is not random.

Typically, soluble silicates are slightly ionized at this pH and their solubility varies little over a wide pH range. Higher temperature increases solubility. The solubility of silicates at different pH values varies greatly among different silicon polymers. When the SiO_2 level exceeds about 70%, silicas are formed, which are readily soluble in acids or alkalis. Unlike silicate, which can be neutralized and still remain the same material. Silica gels range from the acidic end of the pH range to alkali-activated silicas, covering a range of ionized and weakly ionized colloidal materials. The significant increase in silicate solubility compared to modification of SiO_2 polymers has interesting and often beneficial effects, especially in bonding and surface modification. Silicates are known for their ability to crosslink or change from a sol to a gel state with a noticeable change in pH.

The pH value of a 1% solution is approximately 11-12;

4% solution - about 13-14.

The silicate anion is stable over a wide range of alkalinity. In highly concentrated solutions, the alkali can be absorbed by the cation exchange resin to such an extent that the silicate is converted into a soluble cationic form. This is also the mechanism by which silicate becomes silica. The stability of the ion in dilute solution causes the silicate to revert to anionic form and move to a higher pH environment.

The solubility of sodium silicate is affected by the ratio of glass and alkali. As the ratio of SiO_2 to Na_2O increases, the solubility also increases due to the increased polymerization of the material.

Quality control is one of the most important processes in sodium silicate pentahydrate technology because product quality changes as system conditions change. Sodium silicate pentahydrate is difficult to standardize due to the lack of specific characteristics to determine its quality. This is due to the fact that sodium silicate is very reactive towards other substances. Sodium silicate pentahydrate is best used immediately after production. But in fact, it is better to let it sit for a while before using it. Therefore, it is necessary to change the quality of sodium silicate pentahydrate to make it more stable. If too much gel forms, one amount may be good and another may be bad. The following properties are standard for determining the quality of sodium silicate pentahydrate: - viscosity - content of insoluble substances - pH value is a characteristic of sodium silicate, since viscosity describes the nature of sodium silicate. High viscosity sodium silicate has more stable quality. The high viscosity of sodium silicate makes the mixing process difficult when used to make soap. Typically, viscosity is determined in the pulp and paper machine testing room.

CONCLUSION

1. It is recommended to make minimal changes to existing technology. It is proposed to provide mechanical mixing for better mixing of the calcined gypsum and the setting agent. The energy requirement for a mechanical mixing device is slightly higher than for the existing paddle mixing system. But if productivity is controlled by the rate of addition of hardener, the overall increase in energy consumption can be kept within 3-4 percent. Additional energy costs are offset by reduced storage time for devices before testing and shipping. Adding a small dry surface water chamber to the block before removing the group mold

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makes it easier to rework the block early on, eliminating breaks and cracks.

2. It is recommended to change the specification of the hardener to a narrow adjustment period and ensure availability of the product in the local market within the specified radius from the plant. This helps achieve greater consistency in block installation times and reduces unused hardener inventory in production. 3. Purchasing a simple instrument to measure the setting time and tensile bond strength of blocks, paying for or developing a more effective and environmentally friendly hardener, and conducting further research into the effect of surface coatings on the transfer of block properties is one of them. . other effective research directions that may be explored in the future.

REFERENCES

1. Брыков А.С., Данилов В.В., Ларичков А.В. (2006). Особенности гидратации портландцемента в присутствии силикатов натрия. Журнал прикладной химии, 79(4), 533-536.
2. Нажарова Л.Н., Мингазова Г.Г. (2018). Технология метасиликата натрия. Международный академический вестник, 70-74.
3. Горбунов А.О. Равновесие раствор твердая фаза в тройных водно-органических системах, содержащих соли переходных металлов : дис. – СПб, 2017.
4. Рахматов М.С., Бердиева З.М., Адизова Н.З. Перспективы атмосферных оптических линий связи нового поколения //Современные материалы, техника и технология. – 2013. – С. 134-135.
5. Атоев Э.Х. Строение и свойства внутрикомплексных соединений 8-меркаптохинолина (тиооксина) и его производных //Universum: химия и биология. – 2020. – №. 10-2 (76). – С. 29-32.
6. Мавланов Б.А., Адизова Н.З., Рахматов М.С. изучение бактерицидной активности (со) полимеров на основе (мет) акриловых производных гетероциклических соединений //Будущее науки-2015. – 2015. – С. 207-209.
7. Рахматов М.С. Влияние катализатора, температуры и растворителя на синтез и выход продукта реакции с виниловым эфиром салициловый кислоты в присутствии винилацетилена //Universum: химия и биология. – 2020. – №. 11-2 (77). – С. 16-20.
8. Рахматов М.С., Рамазанов Б.Г. Исследование синтеза и изучение свойств дивиниловых эфиров салициловой кислоты //Universum: технические науки. – 2021. – №. 12-5 (93). – С. 51-55.
9. Salimovich R.M., Shavkatovich P.N. Synthesis and study of properties of salicylic acid products //ΛΌГОΣ. – 2020. – С. 25.
10. Мухаммадиев Б. Т. и др. Сверхкритическая экстракция и рафинирование масла семян тыквы диоксидом углерода //Актуальные проблемы

теории и практики электрохимических процессов. – 2017. – С. 33-38.

11. Рахматов М.С., Норова М.С., Давлатов И.Х. Проблемы перспективных материалов для техники и технологии //Современные инструментальные системы, информационные технологии и инновации. – 2014. – С. 342-344.

12. Нарзиев М. и др. Анализ технологических процессов производства пентагидрата силиката натрия //Ilmiy tadqiqot va innovatsiya. – 2022. – Т. 1. – №. 2. – С. 58-65.