

The Reaction Behavior of Sodium Aluminosilicate During Precipitation Process

Shao Shuai

Engineer

Zhengzhou Non-ferrous Metals Research Institute Ltd of CHALCO, Henan, China

Corresponding author: zyy_shsh@rilm.com.cn

Abstract



In this paper, the precipitation behavior of sodium aluminosilicate was analyzed in green liquor with high SiO₂ content. The effect of sodium aluminosilicate precipitation was expounded on product quality. At the same time, through laboratory research, the change of sodium aluminosilicate in seed was determined after the reduction of green liquor silica content, the solution of excessive silica content was proposed in products after the precipitation of sodium aluminosilicate.

Keywords: Precipitation process, green liquor, sodium aluminosilicate, product quality

1. Introduction

In the production of alumina from overseas mines, due to the low reactive silica content in bauxites, in the process of dissolution, the ability of SiO₂ of solution was weak to convert to sodium aluminosilicate, which led to increased SiO₂ levels in green liquor, in the process of precipitation, when the silica was supersaturated in green liquor, it would be precipitated in the form of sodium aluminosilicate, causing the silica content of the product to exceed the standard seriously [1].

It had been pointed out that the precipitation behavior of SiO₂ was mainly divided into three stages in the precipitation process. In the early stage, sodium aluminosilicate was formed, in the middle stage, sodium aluminosilicate was transformed into crystal, and in the late stage, it was silica in the seed adsorption solution, that was, it decreased in the early stage rapidly, unchanged in the middle stage basically, and decreased in the late stage slowly [2],[3]. In general, the SiO₂ content was higher in green liquor, the precipitation process temperature was higher, the precipitation amount of SiO₂ would be higher in the precipitation process. In addition, due to the obvious seed adhesion at the early stage of precipitation process, when the seed particle size was fine, the effect of adhesion was great, the SiO₂ in the solution would precipitate in large quantities at this time, so the refinement of seed particle size would increase the SiO₂ content in the product [4].

Reducing the SiO₂ content of solution was the most effective method to inhibit the precipitation of sodium aluminosilicate in the precipitation process. Through preliminary studies, Zhengzhou Non-ferrous Metals Research Institute Ltd of CHALCO proposed that the concentration of caustic soda could be reduced in circulating mother liquor effectively by increasing the pre-desilication temperature, increasing the solid content of pre-desilication feed, prolonging the dissolution time, and thus inhibiting the precipitation of sodium aluminosilicate in the precipitation process [5].

In this paper, when the content of silica increased in green liquor, the precipitation behavior of sodium aluminosilicate crystals was studied during the precipitation process. At the same time, the seed containing a large amount of sodium aluminosilicate were taken to carry out precipitation process tests. The change of sodium aluminosilicate in seed was determined after the reduction of green liquor silica content, the solution of excessive silica content was proposed in products after the precipitation of sodium aluminosilicate.

2. Percipitation Behavior of Sodium Aluminosilicate in Precipitation Process

When the silica was supersaturated in green liquor, desilication would occur in the precipitation process, and sodium aluminosilicate impurities would be generated in the seed, resulting in the increase of silica content in the seed. In order to study the precipitation behavior of sodium aluminosilicate in the precipitation process, the alumina hydroxide seed with sodium aluminosilicate precipitated in the production site was taken for three consecutive cycles to observe the precipitation of sodium aluminosilicate in the seed. The change of sodium aluminosilicate was observed by scanning electron microscope at the interval of one month. The results were shown in Figures 1 through 9.

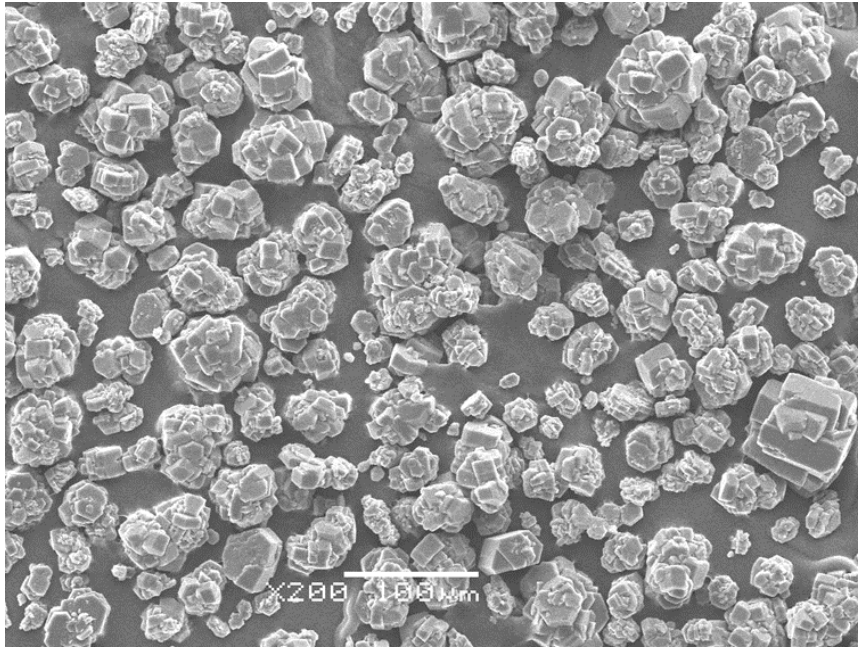


Figure 1. Macromorphology of first-period seed.

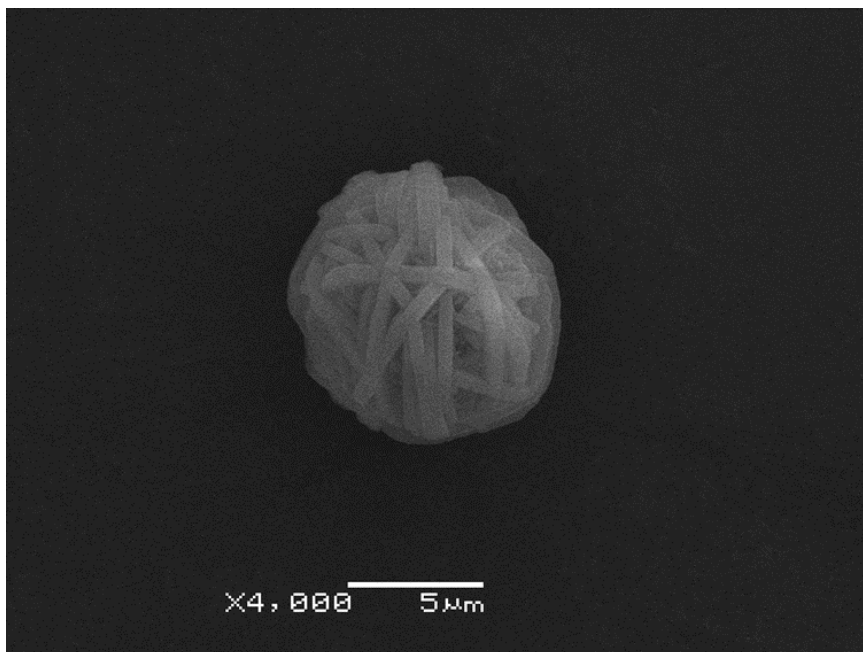


Figure 2. Morphology of sodium aluminosilicate in the first period seed.

2. The precipitation behavior of sodium aluminosilicate was mainly related to the SiO₂ content in green liquor and the induction of sodium aluminosilicate in seed during precipitation process.
3. When the SiO₂ content of the product increased due to the presence of sodium aluminosilicate in the seed, the precipitation of SiO₂ from the solution could be inhibited by reducing the SiO₂ content of green liquor, to inhibit the growth of sodium aluminosilicate crystals and reduce the growth rate of SiO₂ of the product.
4. According to the production situation, the solid content of precipitation process tank was reduced to accelerate the replacement of seed and the expulsion of sodium aluminosilicate crystal.

5. References

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