THE SYNTHESIS AND NEUTRALIZATION OF HYDROXYSODALITE

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Alumina is typically refined from bauxite ore via the Bayer process, which annually generates more than 2.7 billion tons of red mud/bauxite residue worldwide, and this quantity is still growing by 120 million tons per annum [1]. Currently, almost all bauxite residue is stored indefinitely in land-based red-mud disposal areas, bearing potential environmental risks associated primarily with its alkalinity. Therefore, the decreasing the causticity by means of neutralization is crucial for sustainable alumina production.

Sodalite (SOD, $Na_6[Al_6Si_6O_{24}]\times 2NaX$, where X can be OH^-, Cl^-, NO_3^-, $½CO_3^{2-}$, or $½SO_4^{2-}$) is the dominant phase of all by-products forming during the Bayer process, beside hematite [2]. Although sodalite can contain many different anions (depending on the medium), the isomorph containing OH^- is especially important concerning the alkalinity. Hence, this study focuses on the preparation of hydroxysodalite (HS, $Na_8Al_6Si_6O_{24}(OH)_2$) under well-controlled conditions and the neutralization of this aluminosilicate by hydrochloric acid.

Overall, we found a synthesis method that yields hydroxysodalite with unique cubic morphology. Moreover, our findings shed light on the time duration and mechanism of neutralization of this sodalite.

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References
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