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Development of Characterization of Crystal Surface by Electrokinetic Phenomena and Application for Exploration of Additives for Controlling Crystallization Processes

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Summary

Change in zeta potential of $CaCO_3$ crystal during reactive crystallization was studied. In the reactive crystallization with $Ca(OH)_2$ solution and CO_2 gas the zeta potential showed positive value, which suggests the adsorption of Ca^{2+} on the surface of crystal, and dynamic change during the reaction. In the early stage of the reaction the zeta potential of $CaCO_3$ crystal was about +70mV and decreased during the reaction stage. At the neutralization point the zeta potential showed the minimum value about +15mV and increased slowly after the neutralization. It is seemed that this dynamic change in the zeta potential during the reaction can reflect the change in the equilibrium between the ions in the mother liquor and crystal surface. In order to confirm this assumption, the zeta potential of the crystal sampled at the neutralization point was measured with the various ionic composition. The results showed that the change in zeta potential of the crystal will reflect the change in the equilibrium at the crystal surface. The same measurement was conducted in the reaction with in the presence of polyacrylate acid (PAA) as polymeric additive. The zeta potential showed negative value, which suggests the adsorption of PAA on the surface of crystal, and dynamic change during the reaction. These results demonstrated that the change in zeta potential during the crystallization process reflects the change in the equilibrium between the ions in mother liquor and crystal surface and it is the very useful information for controlling the crystallization processes.