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Reactive Crystallization of Lithium Carbonate in the Presence of Magnesium Ions

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Summary

Reactive crystallization has been widely used for producing fine particulate materials. Reactive crystallization techniques are also available to recycling processes of rare metals. And it enables to recover metal salts as high grade crystalline materials. In this study, batch reactive crystallization of Li_2CO_3 was carried out in the presence of magnesium ions as impurity. And influence of magnesium impurity on reactive crystallization process of Li_2CO_3 was mainly investigated.

For the experimental procedure, reactive crystallization of Li_2CO_3 was conducted by batch operation. 1.0 mol/L of LiCl aqueous solution was charged into the crystallizer (volume of crystallizer was 2 L). And then, 1.0 mol/L of Na_2CO_3 aqueous solution was directly added without pumps. Agitation speed was 300 rpm. Temperature was varied from 60 to 75℃. After 90 min, obtained slurry was filtrated and dried. Recovered crystals were observed by using a microscope. Crystal size distribution was measured by microscope method.

Crystal size distribution and crystal shape were modified by magnesium ions, and monodispersity increased with concentration of magnesium ions (CV was less than 20%). Optimal concentration of magnesium was from 1.0 to 10 g/L. Mechanism of improvement of monodispersity in the presence of magnesium ions seemed to be of inhibition of crystal growth due to the adsorption of magnesium ions to the long axis of Li_2CO_3 crystals. Concerning influence of temperature, monodispersity of recovered crystals increased with temperature. In general, solubility of Li_2CO_3 decreases with temperature. Initial supersaturation in each temperature is different, and this factor seemed to affect monodispersity of recovered crystals. In this study, influence of EDTA additive on obtained products was also studied. We found that molar ratio of EDTA to magnesium ions was an important factor to control monodispersity and purity.