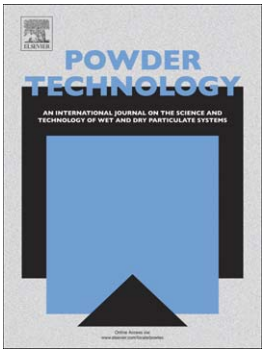

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PII: S0032-5910(16)30834-8
DOI: doi:10.1016/j.powtec.2016.11.042
Reference: PTEC 12118

To appear in: *Powder Technology*

Received date: 4 July 2016
Revised date: 13 November 2016
Accepted date: 26 November 2016

Please cite this article as: Semra Kirboga, Mualla Öner, Investigating the effect of ultrasonic irradiation on synthesis of calcium carbonate using Box-Behnken experimental design, *Powder Technology* (2016), doi:10.1016/j.powtec.2016.11.042

Investigating the Effect of Ultrasonic Irradiation on Synthesis of Calcium Carbonate Using Box-Behnken Experimental Design

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In this study, CaCO3 crystals were synthesized in the presence of the water-soluble polymers carboxymethyl inulin (CMI) and Poly(Vinyl Sulfonic Acid) (PVS) by means of ultrasonic irradiation method. The synthesized $CaCO_3$ crystals were characterized by means of X-ray diffraction (XRD), scanning electron microscopy (SEM), BET (Brunauer, Emmett and Teller), thermal analysis (TGA-DTA) and particle sizer. The pure phase of vaterite was obtained in the presence of PVS, meanwhile, the mixed phases of calcite and vaterite were observed in the presence of CMI.The effects of the amplitude of sonicator (Amp), polymer concentration (PC) and the application time of ultrasound (AT) on the preparation of $CaCO_3$ with respect to the specific surface area (SSA) and particle size of the final product were investigated by applying the Box-Behnken experimental design based on three levels. The experimental values were 0.25 g/L, 0.50 g/L and 0.75 g/L for polymer concentration; 25%, 38% and 50% for sonicator amplitude;1 min, 3 min and 5 min for an application time of the ultrasound. The polymer concentration and application time of the ultrasound were found to be main controlling variables on both surface area and particle size of the crystals. The experimental values agreed with the values predicted by Box-Behnken response surface design under our experimental conditions.

Keywords: Calcium carbonate; precipitation; polymer; vaterite; experimental design.

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