

Effects of different seed forms on crystal size distribution for seeded batch crystallization process

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ABSTRACT

The effects of different seed forms on crystal product distribution are presented for optimizing crystal size distribution (CSD) in the case of seeded batch cooling crystallization process. Three different seed distributions and quality are introduced as variable parameter for CSD control of seeded batch crystallization process via simulation in Matlab software. Similar implementation is conducted in the experimental study using the same operating conditions and parameters. Cubic cooling profile is adapted as the temperature profile for potash alum crystallization system due to its ability to control secondary nucleation. The experimental data obtained from laboratory works are validated the simulation results from Matlab where good agreement has been achieved. In terms of mean crystal size of the final CSD, the seed profile with 0.29 standard deviation labelled Sieved Seed 2, produces the best seed profile for seeded batch potash alum crystallization process because it has the largest size of crystals at mean crystal size of 500 μm grown from 90 μm of seed crystals. However, considerable fine crystals at mean crystal size of 30 μm are also obtained indicating trade-off between large size of crystals and fine crystals are needed. In conclusion, this work highlights the effects of different seed quality in terms of distribution and shape on crystal size distribution as one of the important quality specifications in crystallization process and demonstrates narrow distribution of seed crystals as recommendation on the best seed quality for producing desired CSD.

KEYWORDS

Seed crystal; Cubic profile; Crystal size distribution; Crystallization; Potash alum

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