Dispersion of a saturated gas in a supersaturated solution has been previously reported to promote nucleation rates during batch crystallization, leading to the exploration of this technique as a cost-effective method to control crystal size distributions. Despite the mechanisms are still unknown, it has been hypothesized that the presence of a flowing gas could promote variations in the flow pattern inside the crystallizer, leading to improved mass transfer and higher rates of secondary nucleation through an increased number of crystal collisions. In this work, we have constructed a lab-scale MSMPR crystallizer with self-induced gas dispersion to investigate the applicability of this technique in continuous crystallization. The effect of different gas hold-ups has been evaluated at high supersaturations and for two different suspension densities. Results show a very limited variation in the overall mass deposition rate, and reductions in the mean FBRM chord length not exceeding 5 μm for the highest investigated gas hold-up (12%). Studying the effect of impeller speed under the same conditions, we found that an increased mixing intensity has a similar impact as gas dispersion, with a mean chord length reduction of 4 μm when the impeller speed was increased from 800 to 950 rpm. These results suggest that the promotion of nucleation kinetics with gas dispersion is limited to systems where crystallization kinetics can be significantly affected by mixing, and demonstrate a limited applicability for crystal size distribution control in continuous MSMPR crystallizers.
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.22 SJR 1.213 SNIP 0.909
Web of Science (2011): Impact factor 2.391
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.12 SNIP 0.965
Web of Science (2010): Impact factor 2.207
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.063 SNIP 0.924
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.955 SNIP 0.926
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.017 SNIP 0.944
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.093 SNIP 0.889
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.862 SNIP 0.817
Scopus rating (2004): SJR 0.708 SNIP 0.797
Scopus rating (2003): SJR 0.436 SNIP 0.658
Scopus rating (2002): SJR 0.595 SNIP 0.841
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.623 SNIP 0.742
Scopus rating (2000): SJR 0.332 SNIP 0.732
Scopus rating (1999): SJR 0.529 SNIP 0.639
Original language: English
Keywords: Melitracen hydrochloride, Continuous crystallization, MSMPR, Mixing, Gas
DOIs:
10.1021/acs.oprd.8b00376
Source: RIS
Source-ID: urn:7E089AF38BCD6A49EE04CDCD380AAB56
Research output: Research - peer-review › Journal article – Annual report year: 2019