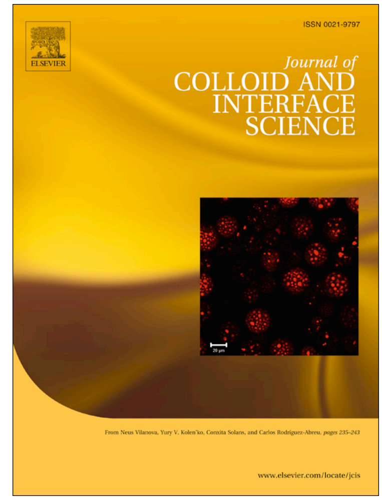
Accepted Manuscript



Mechanisms behind Overshoots in Mean Cluster Size Profiles in Aggregation-Breakup Processes

Ramiar Sadegh-Vaziri, Kristin Ludwig, Kai Sundmacher, Matthaus U. Babler

PII: S0021-9797(18)30585-X
DOI: https://doi.org/10.1016/j.jcis.2018.05.064
Reference: YJCIS 23642

To appear in: *Journal of Colloid and Interface Science*

Received Date: 8 January 2018
Revised Date: 25 April 2018
Accepted Date: 21 May 2018

Please cite this article as: R. Sadegh-Vaziri, K. Ludwig, K. Sundmacher, M.U. Babler, Mechanisms behind Overshoots in Mean Cluster Size Profiles in Aggregation-Breakup Processes, *Journal of Colloid and Interface Science* (2018), doi: https://doi.org/10.1016/j.jcis.2018.05.064

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Mechanisms behind Overshoots in Mean Cluster Size Profiles in Aggregation-Breakup Processes

Ramiar Sadegh-Vaziri,[1] Kristin Ludwig,[2] Kai Sundmacher,[2,3] and Matthaus U. Babler[1,*]

[1] *Department of Chemical Engineering, KTH Royal Institute of Technology, SE-10044 Stockholm, Sweden*

[2] *Max Planck Institute for Dynamics of Complex Technical Systems, Process Systems Engineering, Sandtorstr. 1, 39106 Magdeburg, Germany.*

[3] *Otto von Guericke University Magdeburg, Process Systems Engineering, Universitätsplatz 2, 39106 Magdeburg, Germany.*

(Dated: April 25, 2018)

Abstract

Aggregation and breakup of small particles in stirred suspensions often shows an overshoot in the time evolution of the mean cluster size: Starting from a suspension of primary particles the mean cluster size first increases before going through a maximum beyond which a slow relaxation sets in. Such behavior was observed in various systems, including polymeric latices, inorganic colloids, asphaltenes, proteins, and, as shown by independent experiments in this work, in the flocculation of microalgae. This work aims at investigating possible mechanism to explain this phenomenon using detailed population balance modeling that incorporates refined rate models for aggregation and breakup of small particles in turbulence. Four mechanisms are considered: (1) restructuring, (2) decay of aggregate strength, (3) deposition of large clusters, and (4) primary particle aggregation where only aggregation events between clusters and primary particles are permitted. We show that all four mechanisms can lead to an overshoot in the mean size profile, while in contrast, aggregation and breakup alone lead to a monotonic, "S"-shaped size evolution profile. In order to distinguish between the different mechanisms simple protocols based on variations of the shear rate during the aggregation-breakup process are proposed.

* babler@kth.se

ACCEPTED MANUSCRIPT

Download English Version:

https://daneshyari.com/en/article/6990044

Download Persian Version:

https://daneshyari.com/article/6990044

Daneshyari.com