Data Article

Visualization data on concentrating apple juice with a trinitarian crystallization suspension freeze concentrator

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**ABSTRACT**

This article contains visualization data on concentrating apple juice with a trinitarian suspension crystallization freeze concentrator, which integrates scraped-surface heat exchanger, suspension crystallizer and wash-column into one piece of equipment. The visualization data on ice accumulation, ice bed development and consolidation in the crystallizer/wash-column of the freeze concentrator are presented in a set of photographs in chronological order and videos attached as appendix materials. These data refer to the related research article entitled “Concentration of Apple Juice with an Intelligent Freeze Concentrator” Ding et al., 2019.

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1. Data

Fig. 1(a) shows the apple juice in cooling stage, during which there is no ice in the solution. Fig. 1(b) shows the appearance of the packed ice bed in the suspension crystallizer used for freeze
concentration, Fig. 1(c)–(e) shows the development of packed ice bed. Fig. 1(f) shows that the crystallizer converts to an in-situ wash column for separating the ice and concentrate at the end of freezing.

The video clips of:
- Appendix A video 1 Ice bed appears.mp4;
- Appendix A video 2 Ice bed builds up 1.mp4;
- Appendix A video 3 Ice bed builds up 2.mp4;
- Appendix A video 4 Final packed ice bed 1.mp4;
- Appendix A video 5 Final packed ice bed 2.mp4.

provide the visualization data of the formation of the packed ice bed in the freeze concentrator. They have been edited to give captions.

Supplementary video related to this article can be found at https://doi.org/10.1016/j.dib.2019.104155

Appendix B 2017080301.xls, this Excel file gives the raw data of one of the experimental trials of freeze concentration of apple juice, which was exported by the controller of the instrument and recorded by a computer in real time.
2. Experimental design, materials, and methods

The apple juice used in this study was Huiyuan® brand (China Huiyuan Juice Group Ltd., Beijing, China) purchased in a local market.

The apple juice was cooled and frozen to produce ice slurry by a scraped-surface heat exchanger below a 2.5-L suspension crystallizer. As the content of ice accumulated in the apple juice, a tightly packed ice bed was formed at the end, and the crystallizer then converted to a wash column that was used for separate the ice with the concentrated apple juice [1]. The separation of ice and concentrate is performed by in-situ top downwards wash of the ice with 0 °C water to displace the concentrate. The freezing point depression (FPD) data of sixteen liquid were saved in the controller. It can therefore handle several commonly seen liquid food.

Fig. 1. The appearance, accumulation of floating ice particles and the formation of a packed ice bed in the suspension crystallizer, which converts to a wash column at the end of freezing stage.
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Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dib.2019.104155.

References

[1] Z. Ding, F.G.F. Qin, J. Yuan, S. Huang, R. Jiang, Y. Shao, Concentration of apple juice with an intelligent freeze concentrator, J. Food Eng. 256 (2019) 61–72.