Analysis and model-based optimization of a pectin extraction process - DTU Orbit
(16/08/2019)

Analysis and model-based optimization of a pectin extraction process

Raw material quality disparity is an unavoidable and systemic variability in the solid-liquid extraction process of pectin manufacturing. A mathematical model is considered for a robust optimization of the process, taking into account raw material quality uncertainty, for two different scenarios of pectin product quality profiles. Before application, the model is evaluated through local sensitivity analysis. Raw material-specific parameters and non-significant parameters are removed from the parameter set targeted for identification. Furthermore, it is shown that the model outputs are highly sensitive to the peel specific parameters, which inherently vary from peel-to-peel. This impact was further assessed through an uncertainty analysis, which quantified the variability of model predictions due to the raw material parameter uncertainty for three different types of fruit. The model exhibits a good general depiction of the extraction phenomena. Major operating variables, i.e., temperature, pH and batch time, are optimized in a deterministic manner for each fruit to maximize the final pectin concentration while satisfying given requirements. Based on this, a robust optimization strategy is examined to design an optimal operation strategy in consideration of the inherent uncertainty of feedstock and the desired product quality.

General information
Publication status: Published
Organisations: Department of Chemical and Biochemical Engineering, PROSYS - Process and Systems Engineering Centre, Korea Advanced Institute of Science and Technology, CP Kelco ApS
Corresponding author: Huusom, J. K.
Pages: 159-169
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Journal of Food Engineering
Volume: 244
ISSN (Print): 0260-8774
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
Original language: English
Keywords: Pectin, Solid-liquid extraction, Model-based optimization, Model analysis
DOIs:
10.1016/j.jfoodeng.2018.09.016
Source: RIS
Source-ID: urn:1335C4733B9BC72D65DD05F39C3CB55D
Research output: Contribution to journal › Journal article – Annual report year: 2019 › Research › peer-review