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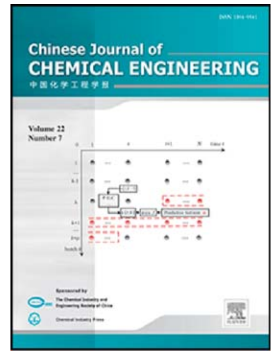

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Process Optimization with Consideration of Uncertainties-An Overview

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Abstract Optimization under uncertainty is a challenging topic of practical importance in the Process Systems Engineering. Since the solution of an optimization problem generally exhibits high sensitivity to the parameter variations, the deterministic model which neglects the parametric uncertainties is not suitable for practical applications. This paper provides an overview of the key contributions and recent advances in the field of process optimization under uncertainty over the past ten years and discusses their advantages and limitations thoroughly. The discussion is focused on three specific research areas, namely robust optimization, stochastic programming and chance constrained programming, based on which a systematic analysis of their applications, developments and future directions are presented. It shows that the more recent trend has been to integrate different optimization methods to leverage their respective superiority and compensate for their drawbacks. Moreover, data-driven optimization, which combines mathematical programming methods and machine learning algorithms, has become an emerging and competitive tool to handle optimization problems in the presence of uncertainty based on massive historical data.

Keywords optimization under uncertainty, robust optimization, stochastic programming, chance constrained programming, data-driven optimization

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