

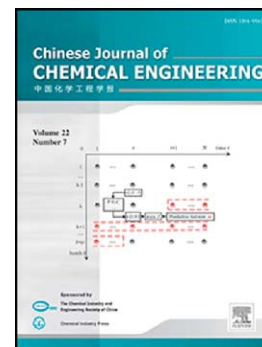
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# A formulation methodology for multicomponent distillation sequences based on stochastic optimization<sup>☆</sup>

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**Abstract:** Based on stochastic optimization strategy, a formulation methodology is proposed for synthesizing distillation column sequences, allowing more than one middle component as the distributing components between a pair of key components in the non-sharp split. In order to represent and manipulate the distillation configuration structures, a new coding procedure is proposed in the form of two-dimensional array. Theoretically, an array can represent any kind of split (non-sharp and sharp). With the application of a binary sort tree approach, a robust flow sheet encoding and decoding procedure is developed so that the problem formulation and solution becomes tractable. In this paper, the synthesis problem is formulated as a mixed-integer nonlinear programming (MINLP) problem and an improved simulated annealing approach is adopted to solve the optimization problem. Besides, a shortcut method is applied to the evaluation of all required design parameters as well as the total function.

**Key words:** distillation sequences synthesis; non-sharp separation; simulated annealing; MINLP; binary sort tree

## 1 INTRODUCTION

Distillation is the most widely used separation technique in petroleum and chemical process industry,

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