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Optimal Design of a Multi-Product Reactive Distillation System for Silanes Production

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Highlights

- Silane is being used for the production of solar photovoltaic cells
- Three types of silane products of interest are dichlorosilane, monochlorosilane and silane
- Typical production requires a network of reactor and separation systems
- It is shown that the three types of silane products can be produced with a single reactive distillation column

Abstract

Silane has found recent applications in the manufacture of solar photovoltaic cells, which provide solar power economically. One method for the production of silane takes trichlorosilane as a starting molecule, with a reaction mechanism that involves two other intermediate valuable products, dichlorosilane and monochlorsilane. The production system involves a series of reactors and separation steps that can be intensified via reactive distillation. In this work, optimal designs of reactive distillation systems for the production of trichlorosilane, dichlorosilane and silane are developed. Furthermore, a multi-product reactive distillation system for the production of any of these types of silane products is designed. It is shown that an intensified design can be obtained for the production of the