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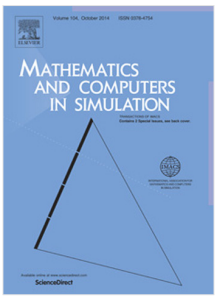


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# Splitting methods for the numerical solution of multi - component mass transfer problems

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**Abstract**

In a multi-component system the diffusion of a certain species is dictated not only by its own concentration gradient but also by the concentration gradient of the other species. In this case, the mathematical model is a system of strongly coupled second order elliptic/parabolic partial differential equations. In this paper we adapt the splitting method for numerical solution of multi-component mass transfer equations, with emphasis on the linear ternary systems. We prove the positive definiteness assumptions for the discrete problem matrices which ensure the stability of the method. The numerical experiments performed confirmed the theoretical results, and the results obtained show good numerical performances.

**Keywords:** multi-component diffusion; splitting method; ternary system; convection-diffusion equation; finite differences;
**MSC 2010:** 65F10, 80A20

# 1 Introduction

An accurate modeling of the mass transfer, particularly for multi-component systems, is necessary because mass transfer governs the overall kinetics for many real-life and industrial processes. For this reason, multi-component diffusion has gained a considerable increasing interest during the last decades.

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