

# 單螺桿押出製程之分配式混合元件：混合分析及最佳化設計

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## 摘 要

單螺桿搭配混合元件之設計已廣泛地應用於高分子加工製程中。藉由混合元件的使用去改善混合的能力，以及提高產品的性質。本文主旨首在模擬不同的分配式混合元件對於混合效益之影響。藉由改變不同之幾何形狀、插栓數量及相對排列位置，來探討與分析高分子流體於單螺桿押出製程的混合程度。研究方式為利用三維有限元素流動分析去模擬高分子流體之流動，主要針對速度分佈及流線進行分析，依此進行混合性能評估。有限元素分析軟體採用ANSYS<sup>®</sup>。至於混合性能，則將藉由總體界面面積增加率和色彩均勻度兩個指標分析比較其混合程度與效益，進而達到最佳化設計。研究結果發現插栓型混合區中以Pineapple混合區之混合效益較佳，楔形混合區則以Dulmage混合區之混合效益較佳。增加元件數量及增加元件軸向間距也有助於混合效益之提升。

# Distributive Mixing Elements for Single Screw Extrusion Process : Mixing Analysis and Optimal Design

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## ABSTRACT

Single screw extruders with mixing elements were widely used in polymer extrusion. The most commonly used mixing elements aim to improve the mixing capability and increase the quality of product. This study aims to simulate the degree of mixing in various types of distributive mixing elements. This study investigated and analyzed the extent of mixing by changing the geometric shapes, numbers, and relative location of mixing pin elements. In this study, the three-dimensional finite element flow analysis was employed to simulate the polymer flow in the mixing section. The software adopted to simulate is ANSYS<sup>®</sup>. The mean bulk ratio of interfacial area and index of color homogeneity were employed to indicate the mixing effect. Furthermore, the study aims to achieve optimal design in the mixing section. The results showed that the degree of mixing were better in Pineapple mixing section and Dulmage mixing section. By adding numbers and axial distance of mixing elements also improved the degree of mixing.