Hele-Shaw流場中可互溶磁性流體複雜指狀化現象之數值分析

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摘 要

運用高精度方法數值模擬Hele-Shaw 流場中可互溶磁性流體複 雜指狀化不穩定現象。施以一個均勻向上的垂直磁場所形成的磁力 會造成複雜指狀化不穩定現象，磁力的影響也會使可互溶界面產生 不穩定，而在可互溶界面中有一類似不可互溶表面張力的非傳統應 力，稱為Korteweg stresses，在非傳統應力的影響下，可互溶界面 所呈現的數值模擬圖形與不可互溶表面張力的作用是極為相像。因 此對Korteweg stresses 定性確立出，在可互溶流體中複雜指狀化不 穩定現象的影響是與表面張力的作用是相似的。除此之外，本研究 也將針對在旋轉Hele-Shaw 流場中可互溶磁性流體做一探討，垂直 磁場、離心力、高黏滯度比差異都是會使複雜指狀化不穩定現象更 為劇烈，而由中心電流線導致的水平磁場、旋轉效應導致的科氏力、與可互溶界面的Korteweg stresses 卻可以使界面不穩定現象較 趨緩穩定，這證明了這些因素都對可互溶磁性流體界面指狀化不穩 定現象有所影響。

關鍵詞 : Hele-Shaw 流場，複雜指狀化不穩定現象，磁性流體， Korteweg stresses，科氏力

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