可互溶HELE-SHAW流場界面不穩定之數值分析

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摘 要

利用高準確率的數值方法模擬在濕潤CELL與乾燥CELL中旋轉HELE-SHAW流場可互溶界面之指狀化現象，界面的不穩定性取決於三個主要的控制參數，如旋轉強度、黏滯度比控制參數和物種流體之間的擴散。若一較大密度且黏稠之圓滴放置於旋轉中心，因受向心力之影響，界面會產生不穩定效果，然而同時 因黏滯度差異亦會促使界面穩定，因而指狀化現象之產生乃取決於此二相反機制之競爭。然而擴散強度 的效應並不能改變指狀型態，但會使不穩定性趨於緩和。而由液滴的中心注入流體的強度會導致界面的 不穩定性成長被迫延遲，然而對較黏的可互溶液環或者注入的是黏滯度較小流體而言，提供內界面與外 界面的不穩定機制則不同，外界面是旋轉效應提供不穩定機制而黏滯效應提供穩定的機制，內界面表現則相反，所以注入強度驅使外界面穩定而會擾亂內界面的機制。 通常，慣性座標的計算下，界面將會產生不穩定的多層次逆時針指狀化象，這與不可互溶流體中做的 實驗界面的前沿有液滴噴出的情況是相當類似的。

關鍵詞 : 可互溶流場、數值模擬、HELE-SHAW流場、界面不穩定性

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