Title:	Modeling of Stability in Miscible Fluid System
Authors:	Kumar, Dharmendra (/jspui/browse?type=author&value=Kumar%2C+Dharmendra)
Keywords:	Mathematics Miscible fluid System Spectral Abscissa Stability Analysis Stability Analysis
Issue Date:	26-Sep-2019
Publisher:	IISERM
Abstract:	The goal of this thesis is to study the modeling of stability in miscible fluid system. In general, displacing fluid is less viscous than displaced fluid there form a unstable interface pattern between these two fluids in a porous media called Viscous Fingering. However in inverse case more viscous displacing the others the interface is stable and there is no pattern form. Chouke was the first who analyse the mathematical linear stability of displacement for two immiscible fluid by considering surface tension to act at the interface and found there is a cutoff wave number of the stability and when applying their theory to miscible case, there is no surface tension and diffusion this shows that the growth constant increases with wave number with no bound and this is physically unrealistic. Introduction of diffusion makes any base state profile time dependent. To determine the stability of time dependent flow there are following methods. 1. The quasi-steady-state approximation in which we freeze the time and determine the growth constant. 2. The Self-similar QSSA 3. nonmodal analysis So in this problem we get coupled partial differential equation which we reduce into ordinary differential equation therefore we finally get the system of first order differential equation, which can be written as dX dt = A(t)X. Where matrix A(t) de- termine the stability of the system. In case of normal matrix we get the exponential time dependent solution but in case of non-normal matrix it fails to predict the sta- bility appropriately. Therefore to determine the non-normality of A(t) we define two xiiquantity Numerical Abscissa and Spectral Abscissa. We freeze at different different times and calculate the these two quantity. In case of normal matrix both Numerical Abscissa and Spectral Abscissa will be equal. Therefore at infinite time give the same results in both case modal analysis and nonmodal analysis, but at finite time it does not give the true information of stability in modal analysis of non-normal matrix. However in Nonmodal analysis it gives true information about stability.
URI:	IISERM (IISERM) http://hdl.handle.net/123456789/1146 (http://hdl.handle.net/123456789/1146)

Appears in Collections:	MS-14 (/jspui/handle/123456789/1078)

Files in This Item:

File	Description	Size	Format	
MS14112.pdf (/jspui/bitstream/123456789/1146/3/MS14112.pdf)	Full Text.pdf	4.38 MB	Adobe PDF	View/Open (/jspui/bitstream/123456789/1146/3/I

Show full item record (/jspui/handle/123456789/1146?mode=full)

(/jspui/handle/123456789/1146/statistics)