



复旦大学数学科学学院 数学综合报告会

报告题目: **Analysis of two-grid methods for miscible displacement problem by mixed finite element methods**

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摘要: The miscible displacement of one incompressible fluid by another in a porous medium is governed by a system of two equations. One is elliptic form equation for the pressure and the other is parabolic form equation for the concentration of one of the fluids. Since only the velocity and not the pressure appears explicitly in the concentration equation, we use a mixed finite element method for the approximation of the pressure equation. In order to find a stable finite element discretization method, we use different discretization method for the concentration equation, such as finite element method with characteristic; mixed finite element method with characteristic; expanded mixed finite element method with characteristic etc. To linearize the discretized equations, we use one (two) Newton iterations on the fine grid in our methods. Firstly, we solve an original non-linear coupling problem. Then, solve a linear system on the fine grid and while in second method we make a correction on the coarse grid between one (two) Newton iterations on the fine grid. We obtain the error estimates of two-grid method, it is shown that coarse space can be extremely coarse and we achieve asymptotically optimal approximation. Finally, numerical experiment indicates that two-grid algorithm is very effective.

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