

An optimal viscosity profile in enhanced oil recovery by polymer flooding

Prabir Daripa^{1,*} and G. Paşa²

¹Department of Mathematics, Texas A&M University, College Station, TX-77843

²Institute of Mathematics, Romanian Academy of Sciences, Bucharest, RO-70700

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Abstract

Forced displacement of oil by polymer flooding in oil reservoir is one of the effective methods of enhanced (tertiary) oil recovery. A classical model of this process within Hele-Shaw approximation involves three-layer fluid in a Hele-Shaw cell having a variable viscosity fluid in the intermediate layer between oil and water. The goal here is to find an optimal viscosity profile of the intermediate layer that almost eliminates the growth of the interfacial disturbances induced by mild perturbation of the permeability field. We derive the dispersion relation and sharp bounds on the growth rate of the interfacial disturbances for an optimal viscosity profile of the intermediate layer. We also discuss how and why an appropriate choice of variable viscous profile in the intermediate layer can mitigate not only the Saffman-Taylor instability but also the tendency of preferential channeling of flow through high permeable region in the heterogeneous case.

Key words: enhanced oil recovery, polymer flooding, linear stability.

*Author for correspondence (e-mail: prabir.daripa@math.tamu.edu)