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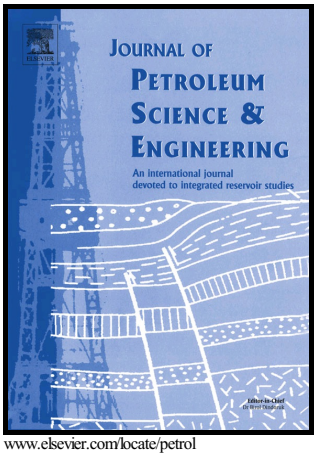
Amin Sharifi Haddad, S. Hossein Hejazi, Ian D. Gates



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Modeling Solvent Enhanced Gravity Drainage from a Single Matrix Block in Fractured Oil Reservoirs

Amin Sharifi Haddad[a,*], S. Hossein Hejazi[b], Ian D. Gates[b]
[a]School of Engineering, University of Aberdeen, SCO, UK
[b]Department of Chemical and Petroleum Engineering, Schulich School of Engineering, University of Calgary, AB, Canada
[*]Corresponding authors: Amin Sharifi Haddad, Tel: +44 (0)1224 272977 Fax: +44 (4) 1224 272497. , amin.sharifi@abdn.ac.uk

Abstract

Solvent based oil recovery is one of the fast growing methods for low emissions-intensity oil recovery from underground resources. In particular, in fractured reservoirs, miscible solvents are injected, and through diffusion and dispersion processes they mix with oil inside the matrix blocks where the oil phase viscosity can be reduced. Consequently, gravity drives the solvent-oil mixture from matrix into fractures, and drained oil is then produced from fracture network. In low permeability matrix blocks or reservoirs with viscous oil, diffusion and convection controls the rate of mass transfer between oil in matrix blocks and solvent in fractures. This study provides a novel semi-analytical solutions that can accurately estimate the mass transfer rates and oil recovery from matrix blocks under gravity drainage. The theoretical results using realistic diffusivity coefficients can accurately match the experimentally measured solvent concentration profiles inside the matrix block. Furthermore, an optimization strategy based on the new model is developed that can be used for a quick evaluation of solvent choice for different oil types and reservoir properties.

Keywords: solvent-based recovery; fractured reservoirs; solvent diffusion; concentration-dependent diffusivity; gravity drainage

Nomenclature

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