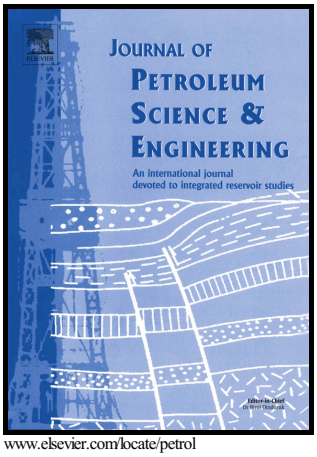

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Performance of Multiple Thermal Fluids Assisted Gravity Drainage Process in Post SAGD Reservoirs

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Abstract

Multiple thermal fluids injection process is a new heat-carrier process proposed in recent years as an EOR process for heavy oil reservoirs. Compared with the conventional saturated-steam injection process, it combines the multiple advantages of immiscible and/or miscible gas injection and thermal recovery processes. In this paper, based on the ideas of the multiple thermal fluids injection process and the conventional steam assisted gravity drainage (SAGD) process, a new recovery process, multiple thermal fluids assisted gravity drainage (MFAGD) process is proposed to enhance heavy oil recovery for post SAGD reservoirs. Two 3D gravity drainage experiments (SAGD and SAGD-MFAGD) are first conducted to explore EOR mechanisms of the multiple thermal fluids in heavy oil reservoirs. Subsequently, numerical simulations are performed to match the experimental measurements. Then the EOR mechanisms and the remaining oil saturation distribution are analyzed. Furthermore, the differences between the SAGD, steam-and-gas-push (SAGP) and MFAGD processes are discussed. From a dimensionless scaling analysis for gravity drainage process, lab scale parameters are converted to field scale ones, and a field scale simulation model is developed. Through the analysis and