

Unified formulation of enhanced oil-recovery methods

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At present enhanced oil recovery (EOR) techniques are essential for maintaining the oil supplies of the world. In turn, mathematical and computational models of the processes that occur in EOR are fundamental for the application and advancement of such methods. Due to the great diversity of processes occurring in EOR, it is valuable to possess unified general procedures for constructing them, which can be easily applied independently of the complexity of the system considered. The *leitmotiv* of this paper is to present a unified mathematical model, including both: the governing system of partial differential equations and shock conditions. It is based on an axiomatic formulation, since axiomatic formulations are the most effective means for achieving generality, simplicity and clarity. In the approach proposed, the construction of the mathematical model is to a large extent automatic; all what is required in order to define the partial differential equations and the shock conditions that constitute such a basic model is to identify the phases and *extensive properties* that participate in the EOR system. Such a basic model supplies a very firm basis on which the phenomenology is incorporated. The procedure is illustrated by deriving the mathematical model of black-oil. An exhaustive description of the shocks that may occur in black-oil models is also included.