7

Emulsions in Enhanced Oil Recovery

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Micellar–polymer flooding and alkali–surfactant–polymer (ASP) flooding are discussed in terms of emulsion behavior and interfacial properties. Oil entrapment mechanisms are reviewed, followed by the role of capillary number in oil mobilization. Principles of micellar–polymer flooding such as phase behavior, solubilization parameter, salinity requirement diagrams, and process design are used to introduce the ASP process. The improvements in "classical" alkaline flooding that have resulted in the ASP process are discussed. The ASP process is then further examined by discussion of surfactant mixing rules, phase behavior, and dynamic interfacial tension.

EMULSIONS ARE OF GREAT IMPORTANCE in enhanced oil recovery (EOR) techniques. In some cases, emulsions may be an unwelcome consequence of the process, but in other cases, the use of emulsions is critical and fundamental to the oil recovery process. In general, processes that rely on the injection of surfactants or surfactant-forming materials into a reservoir rely heavily on emulsion technology. Micellar–polymer flooding and alkali–surfactant–polymer flooding are two examples in which emulsion technology specific to the process has evolved to meet special needs. In these processes it is necessary to understand the behavior of an emulsion as it is injected into or formed in a reservoir, as it travels through that reservoir over a period of weeks or months, and as it flows out of the reservoir through a producing well. This chapter discusses the basics required for an appreciation of these processes.

Throughout this chapter, microemulsions will be treated as a type of emulsion, even though there are fundamental differences between the two. Microemulsions are thermodynamically stable and will not segregate with

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