
Surfactant-enhanced remediation of LNAPL contaminated porous medium

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Abstract

The process of surfactant-enhanced remediation (SER) of a porous medium contaminated with a light non-aqueous phase liquid (LNAPL) was studied using magnetic resonance imaging (MRI) method. A series of experimental studies were carried out to analyze the dynamic behavior of immiscible phase displacement. The residual saturation curves of non-wetting phase were constructed as a function of the injected pore volume. Resulting in a comparative analysis between different experimental research the effectiveness of the SER method for residual LNAPL displacement in porous medium has been shown. It was observed that the displacement of residual LNAPL is a slow process and leads to better results for large injected pore volumes. A quantitative analysis was performed and showed that after surfactant injection, the residual LNAPL saturation had decreased by approximately 11% compared to the initial residual saturation of the non-wetting phase obtained after simple water flooding. It was revealed that both SER method and simple water flooding is more effective in area of higher LNAPL saturation. For low values of the saturation of the immiscible phase, it was observed that the displacement of the non-wetting residual phase was effective in a porous medium by flooding in water containing surfactants. A numerical model taking in account gravitational, viscous and capillary forces has been developed to evaluate the SER efficiency of a porous medium contaminated with LNAPL.

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