

Phachara Wongthanee 2010: Wettability Study of NAPL and Limestone Surface by Measuring Contact Angles and Hysteresis Curves. Master of Engineering (Environmental Engineering), Major Field: Environmental Engineering, Department of Environmental Engineering. Thesis Advisor: Assistant Professor Cheema Soralump, Ph.D. 199 pages.

According to contamination of NAPL (nonaqueous phase liquid) substance in limestone subsurface at Tambol Klangdong, Parkchong, Nakornrachasima province, this research was aimed to study the wettability in contaminated subsurface. This study used crystalline limestone as porous media. Toluene and TCE represented LNAPL and DNAPL substances, respectively. Changes in wettability were conducted by USBM index base on NAPL-water hysteresis curve and visualization of contact angles from contact angle cell experiment. Hysteresis curve was measured under the change between capillary pressure of -NAPL and water saturation in different situation; toluene and water system, TCE and water system, toluene –TCE and water system, TCE-toluene and water system in the media. Imaging the contact angle was done beneath the contamination of single NAPL, which was surrounded with imitated groundwater, and mixed NAPL, which was covered with exceeded solubility of toluene as closed system.

By analysing 2 cycles of USBM index from hysteresis curve, the result of the wettability assessment in porous media that the toluene-water system (USBM index₁, USBM index₂ = 0.12, 0.22), and the TCE-and toluene-water pressure system, respectively were neutral wet (USBM index₁ = 1.99, USBM index₂ = -0.06). Whereas only TCE-water system (USBM index₁ = 1.17, USBM index₂ = 1.54), and toluene-and TCE-water system, respectively were strongly water wet (USBM index₁ = 0.30, USBM index₂ = 1.71). The advancing contact angles of TCE on limestone surface with single NAPL contamination surrounding with groundwater were measured during 23.16 to 33.16 degrees and the receding contact angles were ranged in 53.85 to 92.22 degrees that change was toward neutral wet within 480 hours. The advancing contact angles of mixed NAPL contamination surrounding with exceeded toluene solubility were measured during 24.42 to 70.23 degrees and the receding contact angles were measured during 79.68 to 125.70 degrees that identified as neutral wet in 720 hours. And area of -TCE was hardly decreased because of adaptation to closed system by itself.

Student's signature

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