

Kasama Channiam 2009: Surface Wettability of Comingle NAPL Contamination by Imbibition Rate Test and Capillary Pressure - Water Saturation Relationship. Master of Engineering (Environmental Engineering), Major Field: Environmental Engineering, Department of Environmental Engineering. Thesis Advisor: Assistant Professor Cheema Soralump, Ph.D. 106 pages.

This research studied surface wettability of comingle contamination between DNAPL (Dense Nonaqueous Phase liquid) and LNAPL (Light Nonaqueous Phase Liquid) by imbibition rate test and capillary pressure – water saturation relationship. TCE is DNAPL agent and Toluene is LNAPL agent. The experiment separated in 3 parts : air – water imbibition rates, oil – water capillary pressure curve coupled with calculation of the USBM (U.S. Bureau of Mines) wettability index and oil permeability – water saturation.

Result of the imbibition rate test at the end time showed water saturation of non exposure medium sample was 76.66%. This's a significant differentiated of 82.96% and 84.98% water saturation of DNAPL exposure medium sample and LNAPL exposure medium sample respectively. When medium sample exposed to comingle NAPL, water saturation of initially DNAPL exposure and then Toluene exposure was 75.09% and water saturation of initially LNAPL exposure and then DNAPL exposure was 73.88%, this's not a significant differentiated water saturation. From Laplace's equation found out interfacial energy and contact angle was the cause of water saturation different at the end time. Result of oil – water capillary pressure curve coupled with calculation of the USBM wettability index showed a change to less hydrophilic when the medium was exposed to comingle NAPL. USBM wettability index of water – LNAPL system was 1.36. USBM wettability index of water – LNAPL system and DNAPL residual was 0.56. USBM wettability index of water – DNAPL system was 0.395. And USBM wettability index of water – DNAPL system and LNAPL residual was -1.63. Result of relative permeability – water saturation showed decreasing permeability of DNAPL and LNAPL when NAPL residual were in medium.

Wettability changed to less hydrophilic when the contamination zone changed from one NAPL contamination to comingle NAPL contamination. So in NAPL comingle contaminated field need more methodology and engineering technic to recovery than one NAPL contamination field for the highest efficient.

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Thesis Advisor's signature