1998 Fall Meeting
Search Results:

Your query was:
miscible

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HR:     0830h
AN:     H21B-07
TI:     Modeling Miscible and Immiscible Ferrofluid Flow in Porous Media
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AB: We are investigating the use of ferrofluids for environmental engineering applications.
Ferrofluids are suspensions of single domain magnetic particles stabilized by surfactants in
carrier liquids. In the absence of a magnetic field, aqueous ferrofluids are miscible in water.
However, nearly pure ferrofluid can be recovered from mixtures of water and ferrofluid by the
application of a strong magnetic field. Thus the miscibility and immiscibility of ferrofluid is a
function of the strength of the magnetic field and the concentration of ferrofluid in the mixture.
This characteristic suggests the use of two different conceptual models for ferrofluid-water
mixtures depending on the strength of the external magnetic field and ferrofluid concentration:
(1) single-phase, with ferrofluid a component; or (2) two-phase, with ferrofluid comprising a
second liquid phase. Regardless of which conceptual model is used, ferrofluid flow and
transport are strongly coupled since the force on the ferrofluid due to the external magnetic

field is related to the concentration of ferromagnetic particles, and this force changes drastically with distance from the magnetic source. We have developed numerical simulation capabilities for both the miscible and immiscible conceptual models. The numerical simulation capabilities are built upon the TOUGH2 simulator. TOUGH2 is based on the integral finite difference method and uses a fully coupled residual-based formulation that is efficient for strongly coupled flow and transport problems. Comparisons of simulation results using both the miscible and immiscible conceptualizations to laboratory experiments reveals the advantages and disadvantages of the two approches for different kinds of flow problems.

This work was supported U.S. Department of Energy, under contract No. DE-AC03-76SF00098.

DE: 1829 Groundwater hydrology
DE: 1832 Groundwater transport
DE: 1899 General or miscellaneous
SC: H
MN: 1998 Fall Meeting

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