Simultaneous Transport of Fine Bubbles and Colloidal Particles in Porous Media

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Potential applications of fine bubble (FBs) have drawn more attention, especially in environmental engineering fields such as soil/groundwater remediation. Since colloidal particles exist in natural soil water, it is expected that simultaneous transport of FBs and colloidal particles occurs when FBs are applied to soil environment. In this study, batch experiments were conducted to investigate stability of FB (generated by air) solution, calboxyl latex (CL) solution, and mixture of FB and CL (FB-CL) solutions. Each solution was kept in air-tight bottle for several days, and time series change of bubble and particle size distributions were measured using resonant mass measurements. In addition, one-dimensional column transport experiments using glass beads were conducted, where FB solution, CL solution, or mixture of FB and CL solutions were injected to the column with a constant water flux. The turbidity, pH, EC, DO, and bubble or particle size distribution in the effluent were measured.
Batch experiments showed that bubble concentrations of FB and FB-CL solutions decreased with time. On the other hand,while particle concentrations of CL kept constant, that of FB-CL solutions decreased with time, respectively, indicating CL in FB-CL solutions was influenced by FB or dissolved gas (air). On the column transport experiments, applied FB concentration in FB-CL solutions affected FB effluent ratio. Higher FB mobility was observed when FB water with high concentration was applied, while particle concentrations in FB-CL solution does not affect FB effluent ratio. Effects of FB and CL interaction on the simultaneous transport of FB and CL will be further discussed.

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