

Effects of Bubble Concentration and Ionic Strength on Nano Bubbles Transport in Saturated Porous Media

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An understanding of nano-scale bubble (NB) transport in porous media is important for potential application of NBs in soil/groundwater remediation. It is expected that the physical properties and solution chemistry of NB water highly influences the surface characteristics of NBs and porous media and the interaction between them, thus affecting the transport characteristics of NB. In this study, one-dimensional column transport experiments using glass beads were conducted, where air-NBs water were injected to the column. The turbidity, pH, EC, DO, and bubble size distribution in the effluent were measured. Effects of bubble concentration and ionic strength on the NBs transport were investigated based on the column experiments. The results showed that relative turbidities (measured turbidity in the effluents / turbidity in the applied NBs water) during the NBs water injection were lower for NBs water at lower bubble concentration. In addition, with increasing ionic strength in NBs water, lower relative turbidities in the effluents were observed, suggesting reduced repulsive force between NBs and glass beads surface. For NBs water at the same ionic strength, NBs water containing Na⁺ showed higher NBs mobility as compared to one containing Ca²⁺. Thus, ion species also influenced NBs transport characteristics.

Keywords: Nano Bubble, Transport, Porous Media, Ionic Strength, Bubble concentration