Physical characterization of soils mixed with slurries of clay and zero-valent-iron

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Recently, soil mixing has been used as an *in situ* technique for treatment of contaminant source zones, primarily chlorinated solvents. *In situ* treatment of contamination via soil mixing involves the addition of slurry containing a stabilizing agent and a reactive agent to the contaminated zone. The mixing process: (1) destroys or reduces heterogeneities in the soil profile within the treated zone, (2) provides for uniform distribution of the stabilizing and reactive agents, and (3) enhances dispersion and partitioning of the contaminant into aqueous, sorbed, and/or gas phases. This study was conducted to evaluate the vertical variation in the clay, iron, and water contents, total and dry unit weights, void ratio (porosity), degree of water saturation, saturated hydraulic conductivity, and post-mixing expansion. The evaluation was based on the results of a laboratory study involving vertical mixing of columns of sand with slurries containing varying clay and zero-valent iron (ZVI) contents using a mixing device that was specially manufactured for the study. The consistency of the base slurry (i.e., viscosity) was shown to affect the vertical variation in all of the above parameters. The results of the evaluation also indicate that the base slurry: (1) acts as a suspending fluid for the ZVI enabling injection, (2) acts as a drilling fluid, (3) stabilizes the ZVI within the treated zone, and (4) decreases permeability of the treated zone. In general, target clay and iron contents and improved uniformity of the above parameters was achieved with thicker (i.e., more viscous) base slurries. Results also indicate design for field applications will need to incorporate optimization between desired results and construction feasibility factors (i.e., permeability, strength and compressibility) versus post-mixed expansion, and efficiency of pumping, injection, and mixing.